TM 11-5820-398-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

RADIO SET AN/PRC-25

HEADQUARTERS, DEPARTMENT OF THE ARMY
8 JANUARY 1963

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

When Receiver-Transmitter, Radio RT-505/PRC-25 is in a transmit condition, 45 volts dc and 125 volts dc are generated in module A1 and applied to transmitter power amplifier V1. The 45-volt potential is also applied to modules A6 and A7. Take all necessary precautions.

DON'T TAKE CHANCES!

CAUTION

This equipment is transistorized. Before connecting test equipment within the modules, insulate test prods and clips with insulating tape or sleeving. Leave an absolute minimum of exposed metal, and be extremely careful to avoid short circuits; they may cause extensive damage. Do not make resistance measurements unless specifically directed to do so.

Technical Manual
No. 11-5820-398-35

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *8 January 1963*

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CHAPTER 1

INTRODUCTION

1. Scope

a. This manual covers field and depot maintenance for Radio Set AN/PRC-25. It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, aligning, and repairing the equipment. Detailed functions of the equipment are covered in the theory chapter.

b. The complete set of technical manuals for this equipment includes TM 11-5820-398-10, TM 11-5820-398-20, TM 11-5820-398-20P, and TM 11-5820-398-35P.

c. Forward all comments on this publication direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, New Jersey. (DA Form 1598 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or letter may be used.)

2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, Changes, or additional publications pertaining to your equipment. Department of the Army Pamphlet No. 310-4 is a current index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest Changes to and revisions of each equipment publication.

CHAPTER 2

THEORY

Section I. BLOCK DIAGRAM ANALYSIS

3. Receiving Signal Path (fig. 82)

Receiver-Transmitter, Radio RT-505/PRC-25 is tunable in 50-kilocycle (kc) increments over a frequency range of 30.00 to 75.95 megacycles (mc) to provide 920 channels. The frequency range is covered in two bands: the low band is 30.00 to 52.95 mc; the high band is 53.00 to 75.95 mc. The front panel tuning controls and the BAND switch are used for tuning the RT-505/PRC-25 to the desired frequency.

a. The incoming radiofrequency (rf) signals are coupled from the antenna through the antenna loading network to the power amplifier tank. The antenna loading network matches the antenna circuit impedance to the long or the short antenna. The power amplifier tank couples the rf signal to the receiver first rf amplifier. The power amplifier tank tunes both the receiver and transmitter signals. Relay K1 protects the receiver first rf amplifier from the high power during transmission by grounding the input to the receiver first rf amplifier. The amplified signal from the receiver first rf amplifier is applied to the receiver second rf amplifier, where it is amplified and applied to the receiver mixer.

b. The output from the variable frequency oscillator (vfo), ranging in frequency from 41.50 to 64.45 mc in 50-kc increments, is applied through the vfo buffer to the receiver mixer. The receiver mixer heterodynes the two signals to produce the 11.5-mc intermediate frequency (if.). The vfo frequency is stabilized by the output of the frequency synthesizer system (para 5). The ganged tuning capacitor is positioned by the mc and kc tuning controls through a gear train.

c. The 11.5-mc if. output of the receiver mixer stage is coupled through the 11.5-mc crystal filter, and amplified by the receiver first, second, third, fourth and fifth if. amplifiers. The receiver fifth if. amplifier output is applied to the receiver discriminator driver. The receiver discriminator driver output is applied to the receiver discriminator. The five receiver if. stages (A21) have a power gain of approximately 85 decibels (db). The driver output is fully limited. The limited if. signal is applied to the receiver discriminator, which demodulates the if. signal. The audio output of the receiver discriminator is applied to the receiver first audio amplifier.

d. The receiver first audio amplifier output is applied to both the VOLUME control and to the squelch input amplifier. The VOLUME control controls the audio signal level to the receiver audio output amplifier. The amplified signal from the receiver audio output amplifier is fed to the handset. The two receiver audio amplifiers also amplify sidetone signals from the speech amplifier limiter of the transmitter section during transmission.

e. During squelch operation, when no signal is being received, the audio output circuit is shorted to ground through contacts of squelch relay K3. If an rf carrier having a squelch tone is received, K3 is energized by an output from the relay driver, the short circuit is removed, and audio signals are fed to the H-138/U handset. Relay K3 will be energized only if the output from the receiver first audio amplifier includes a 150 cycle-per-second (cps) tone signal. During transmission, the transmitter tone generator provides a 150-cps signal to the squelch input amplifier to prevent shorting the sidetone.

f. The receiver audio amplifier output, including the 150-cps tone, is applied to the squelch input amplifier. The squelch input amplifier with the emitter-follower and squelch feedback amplifier passes the 150-cps tone, which is rectified in the squelch direct current (dc) detector amplifier. When the squelch relay driver receives a signal from the dc detector amplifier, it provides the current necessary to energize K3. When K3 is energized, the ground is removed from the audio output amplifier to allow the audio signal to be fed to the handset.

g. In addition to the function of squelch relay K3 described in *f* above, relay K3 provides a transmitter keying function when two AN/PRC-25's are used for retransmission. During this type of service, the receiving AN/PRC-25 is set for squelch operation. When a signal is received, energizing K3, a ground circuit is completed, through the interconnecting cable, to key the transmitting AN/PRC-25.

4. Transmitting Signal Path (fig. 83)

a. The audio signal developed in the handset microphone is amplified in the first and second speech amplifiers, and limited in the output limiter stage. The output limiter stage has two outputs: it applies the audio signals to the receiver first audio amplifier as sidetone, and applies the audio signal to the modulator. The modulator also has a 150-cps tone input from the 150-cycle tone oscillator, through the feedback amplifier. The modulating voltages applied to the modulator cause the sidestep oscillator (sso) output frequency to vary at the input audio-frequency (af) rate from the microphone and at the 150-cps rate. The output from the 150-cps tone generator is also applied to the squelch input amplifier (para 3*f*).

b. The frequency stability of the sso is greatly improved by the quarter-wave network. The quarter-wave network is a crystal-controlled passive network connected across the sso tuned circuit. The quarter-wave network improves the stability of the sso approximately 40 times relative to its free-running state.

c. The frequency-modulated (fm) output of the sso is coupled through the sso buffer amplifier to the transmitter mixer. The sso buffer prevents loading of the sso by the transmitter mixer. The transmitter mixer heterodynes the 11.5-mc fm signal from the sso with the vfo signal to produce the transmitter output frequency. The vfo is stabilized by application of its output frequency through the frequency synthesizer buffer to the frequency synthesizer system (fss) (para 5). The fss will correct any vfo frequency drift.

d. The transmitter mixer output is applied to the transmitter first rf amplifier. The output of the transmitter first rf amplifier is applied to the transmitter second rf amplifier, which is cascaded with the intermediate power amplifier and the power amplifier. These amplifiers increase the transmitted signal level to the proper amplitude. The transmitter power amplifier output is coupled through the power amplifier tank and antenna loading network to the antenna. During transmission, the input to the receiver is grounded by relay K1 which is energized by receive-transmit relay K2. Relay K2 also energizes the dc-to-dc converter, which supplies the operating voltages (B+ and bias) for the power amplifier tube.

5. Frequency Synthesizer System (fig. 84)

The frequency synthesizer system (fss) is a closed loop, automatic phase control (apc) system which locks the vfo on frequency. The fss is used both during reception and during transmission. During transmission, the vfo output frequency is shifted 50 kc lower than it is during reception. The frequencies shown on figure 84 represent the fss frequencies associated with two typical received frequencies, and are used to illustrate the frequency relationships. The two typical received frequencies are 33.10 mc (low band) and 68.45 mc (high band). All frequencies used in *a* through *i* below can be converted to

those used for transmission, unless otherwise indicated, by subtraction of 50 kc from the given frequency.

a. The vfo output frequency ranges from 41.50 mc to 64.45 mc. The specific frequency depends on the channel selected, and whether the channel is in the high or low band.

(1) When the low band is used, the vfo operates at 11.50 mc above the carrier frequency. For example, at a received frequency of 33.10 mc, the vfo frequency is 44.60 mc.

(2) When the high band is used, the vfo operates at 11.50 mc below the carrier frequency. For example, at a received carrier frequency of 68.45 mc, the vfo frequency is 56.95 mc.

b. The vfo output (*a* above) is applied through the fss buffer and the fss first mixer buffer to the fss first mixer. The two buffer stages isolate the vfo from the fss first mixer to prevent feedback of sidebands created in the mixer. The fss first mixer receives another input from the pulse generator, which is driven by the output of the 1.0-mc crystal oscillator. (During transmission, the output of the 1-mc crystal oscillator, and, therefore, that of the pulse generator, do not change in frequency.) The sinusoidal output of the 1-mc crystal oscillator is applied to the pulse generator where it is shaped into pulses that are rich in harmonic content. The output of the pulse generator, which is applied to the fss first mixer, is a frequency spectrum ranging from 1 through 12 mc in 1-mc increments. (During transmission, the frequency spectrum does not change.) The fss first mixer heterodynes the two inputs and applies the resultant spectrum to the 53-mc filter.

c. Since the frequencies developed in the fss first mixer output will be the two original signals plus their sum and difference, a frequency (plus its upper and lower sidebands) which approaches the 53-mc bandpass will always be generated, regardless of the vfo output frequency. For example, when the vfo is operating at 44.60 mc, the sum of the eighth harmonic (8 mc) of the pulse generator output frequency and the vfo frequency (44.60 mc) equals 52.60 mc.

d. The 53-mc filter passes a band of frequencies, centered at 53 mc, to the fss second mixer. The fss second mixer is also supplied an input signal from the 100-kc interval oscillator (*e* below) through the tuned network, which reduces spurious frequencies. The fss second mixer heterodynes the two signals to produce their difference, which is the fss. if. It is applied to the fss if. amplifier.

e. The output frequency of the 100-kc interval oscillator, which is independent of the receive-transmit condition, ranges from 46.85 mc to 47.75 mc in 100-kc increments. The specific frequency depends on the frequency selected by the kc tuning knob; that is, whichever 50- or 100-kc channel point is selected. Except for the 0.95-mc channel point, the frequency relationship is such that the output of the 100-kc interval oscillator is 46.85 mc above a specific 100-kc channel point (0.00 mc, 0.10 mc, 0.20 mc, etc) and 46.90 mc above a specific 50-kc channel point (0.05 mc, 0.15 mc, 0.25 mc, etc). At the 0.95-mc channel point, the 100-kc interval oscillator is 45.90 mc above the kc indication; therefore, with the kc tuning knob set at the 0.95- or 0.00-mc channel point, the 100-kc interval oscillator frequency will be 46.85 mc; at a 0.05- or 0.10-mc channel point, the frequency will be 46.95 mc; at a 0.15- or 0.20-mc channel point, the frequency will be 47.05 mc; at a 0.85- or 0.90-mc channel point, the frequency will be 47.75 mc.

(1) The fss if. will always be 5.65 mc at the 100-mc channel points during reception, and 5.60 mc during transmission.

(2) The fss if. will always be 5.60 mc at the 50-kc channel points during reception and 5.55 mc during transmission.

f. The fss if. amplifier has a power gain of approximately 40 db to provide adequate limiting for a constant output amplitude. The fss if. amplifier output is applied to the discriminator and to the phase comparator. The phase comparator

also has an input from the 50-kc interval oscillator.

g. The 50-kc interval oscillator generates one of three frequencies: 5.55 mc, 5.60 mc, or 5.65 mc. The specific frequency depends on the frequency selected by the kc tuning knob (50- or 100-kc increments) and whether the RT-505/PRC-25 is receiving or transmitting. When a 50-kc channel point (37.45, 71.25, etc) is selected, the 50-kc interval oscillator output frequency will be 5.60 mc during reception. (During reception, relay K2 causes a frequency shift to 5.55 mc.) When a 100-kc channel point (37.40, 71.20, etc) is selected, the 50-kc interval oscillator output frequency will be 5.65 mc, during reception. During transmission, relay K2 causes a 50-kc shift to 5.60 mc.

(1) During reception, the 50-kc interval oscillator output will always be 5.65 mc at the 100-kc channel point; during transmission, it will be 5.60 mc.

(2) During reception, the 50-kc interval oscillator output will always be 5.60 mc at the 50-kc channel points; during transmission, it will be 5.55 mc.

h. The output of the 50-kc interval oscillator (*g* above) is applied as a reference signal to the phase comparator. The phase of the two input signals (reference signal from the oscillator buffer and fss if.) is compared and a control voltage is developed in the phase comparator. The control voltage is applied through the antihunt network to the apc modulator. If a phase lock exists, the apc voltage will assume the reference level to maintain the vfo on frequency. If a phase difference exists, an error voltage is developed in the phase comparator. This error voltage varies the apc voltage applied to the apc modulator from the reference level to correct the operating frequency of the vfo.

i. If the vfo output is too far from its proper frequency to be corrected by the phase comparator output, the discriminator (which extends the capture range of the fss) will develop a hunt voltage, which increases the deviation of the apc voltage. Since the vfo is far from its correct frequency, the frequency of the signal applied to the discriminator (*f* above) will be considerably removed from the proper fss if. (*e* above). The discriminator will develop a large error (hunt) voltage. This hunt voltage which is applied through the antihunt network to the apc modulator, changes the vfo output frequency to within the pull-in and hold-in capabilities of the phase comparator. The antihunt network stops the hunting action of the vfo when the phase comparator has control of the vfo frequency.

Section II. CIRCUIT ANALYSIS

6. First Rf Amplifier Module A3 (fig. 1)

First rf amplifier module A3 amplifies the signal received from module A2 (para 20). The first rf amplifier consists of a single transistor amplifier, the BAND switch, and tuned output circuits.

a. The input signal from module A2 is coupled through transformer T1 and coupling capacitor C3 to the base and emitter of transistor Q1. The center-tap of the secondary of T1 is returned to rf ground through capacitor C2. The use of the tapped transformer input coupling neutralizes the stage and isolates the rf amplifier from the power amplifier tank circuit. The output of Q1 is taken from the collector through coupling capacitor C5 and resistor R4 to BAND switch S1. Resistor R4 suppresses parasitic oscillations.

b. Switch S1 is positioned by the BAND switch on the front panel. The collector circuit of Q1 is tuned in each of the two BAND positions as follows:

(1) *Low band.* Transformer T2, fixed capacitor C8, trimmer capacitor C7 and tuning capacitor C2C (fig. 1) make up the tuned circuit. The position of tuning capacitor C2C is determined by the mc and kc controls on the front panel.

(2) *High band.* Transformer T3, fixed capacitor C11, trimmer capacitor C9, and tuning capacitor C2C make up the tuned circuit. Switch S1-D shorts the low-band tuned circuit to prevent loss of energy when operating on the high band.

c. The combination of resistors R3 and R2 establishes the fixed bias for transistor Q1. Resistor R1 is the emitter swamping resistor. Capacitor C6 and resistor R4 form a parasitic suppressor. Inductor L2 is an rf decoupling coil. Capacitors C1 and C4 and inductor L1 make up a pi-type rf filter which prevents rf leakage into the power supply. Capacitor C10 is connected in series with tuning capacitor C2C (fig. 88) on the high band by S1C to decrease the effect of tuning capacitor C2C. Test jack J2 can be used for measuring the input signal to module A3. Inductor L3 (in the main frame (fig. 88)) is an rf filter choke in series with the +10-volt regulated input to module A3.

7. Second Rf Amplifier Module A4 (fig. 2)

The second rf amplifier module A4 amplifies the signal from first amplifier module A3 (para 6). The A4 output is applied to receiver mixer module A5 (para 8). The second rf amplifier consists of a single transistor amplifier, a BAND switch, and tuned output circuits. The circuit configuration and operation of module A4 is similar to that of first rf amplifier module A3 (para 6) except that tuning capacitor C2D is used.

8. Receiver Mixer Module A5 (fig. 3)

Receiver mixer module A5 heterodynes the rf signal from second rf amplifier module A4 (para 7) with the vfo output to produce an if. of 11.5 mc. Module A5 consists of a receiver mixer stage, a vfo buffer stage, a coupling transformer, and a tuned output circuit. The dc operating voltage is available to this module during reception only.

a. The rf signal input is coupled to the base of receiver mixer Q1 through isolating resistor R2 and coupling capacitor C2. The vfo input signal from module A9 is coupled to the base of vfo buffer Q2 through isolating resistor R1 and coupling capacitor C1. Resistor R4 matches the impedance of the input circuit. The vfo buffer output is coupled to the emitter circuit of transistor Q1 through coupling transformer T1. The buffer base bias is determined by a voltage divider composed of R5 and R6.

b. The potential on the base of transistor Q1 is varying at the rf signal frequency and the emitter potential is varying at the vfo frequency; the collector output circuit if tuned to the difference between the two input frequencies; 11.5 mc. The collector circuit consists of the primary of transformer T2 and capacitor C6.

c. The combination of capacitor C3 and resistor R9 neutralizes Q1. Capacitors C4, C5, and C7 are rf bypass capacitors. The combination of capacitor C8 and inductor L1 decouples the module circuit from the 10-volt dc supply. Resistors R5 and R6 develop base bias for transistor Q2. Resistor R7 is the emitter swamping resistor. Resistor R3 provides damping for the primary of coupling transformer T1.

9. Receiver If. Amplifier Module A21 (fig. 85)

The if. amplifiers provide amplification of the 11.5-mc if. signal from 11.5-mc filter module A27. The if. amplifier module consists of five stages of amplification, and a discriminator driver output.

a. If. Amplifiers Q1, Q2, and Q3.

(1) The input from the 11.5-mc filter module is coupled through inductor L1, developed across resistor R2, and coupled to the base of receiver first if. amplifier Q1 through capacitor C1. The signal output from Q1 is coupled through capacitor C4 and developed across base resistor R7 of Q2. Amplifier Q2 develops its output signal across resistor R10. This output signal is coupled through capacitor C7 and is developed across base resistor R11 of third if. amplifier Q3. The collector output of Q3 is developed across

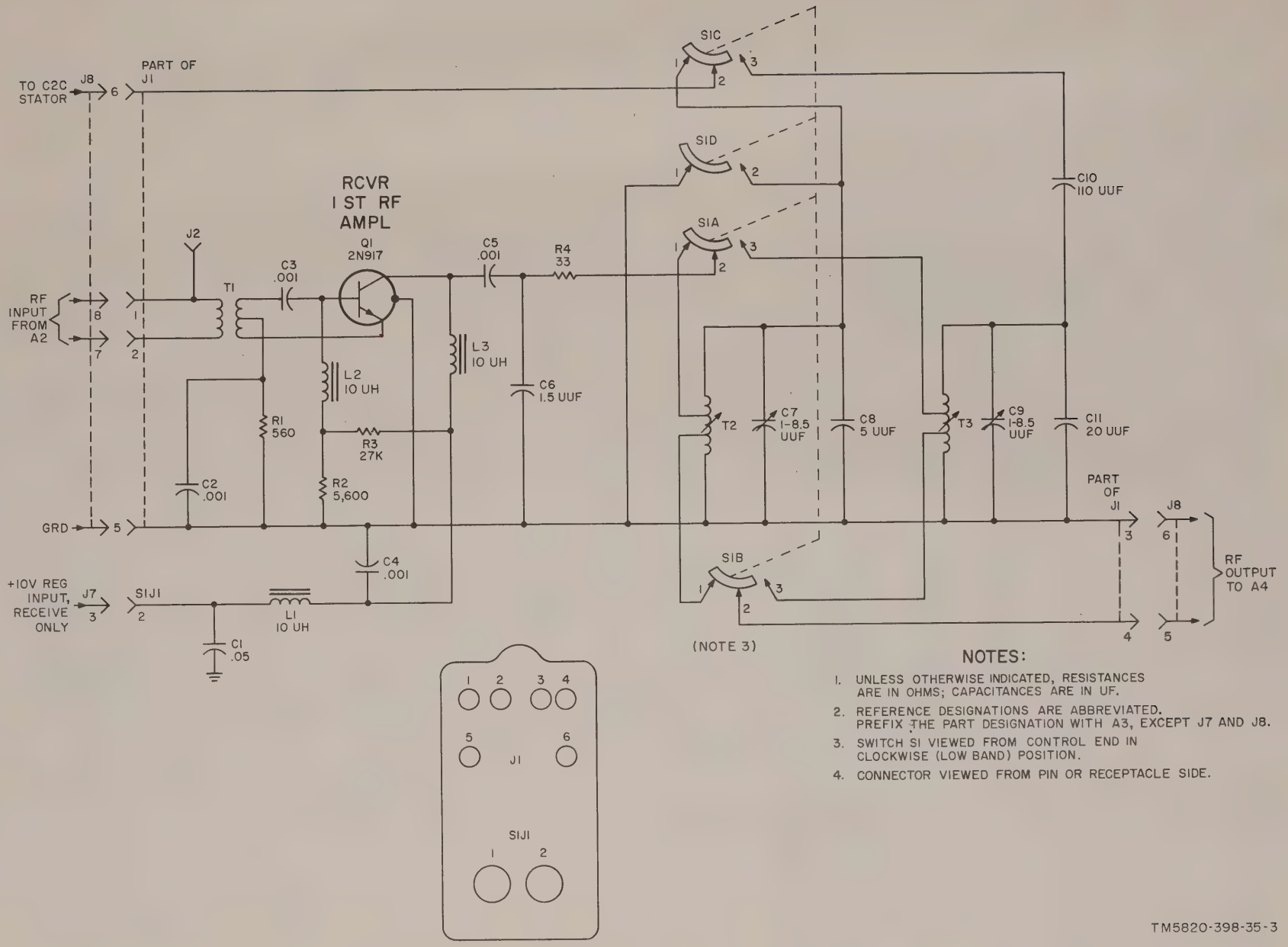
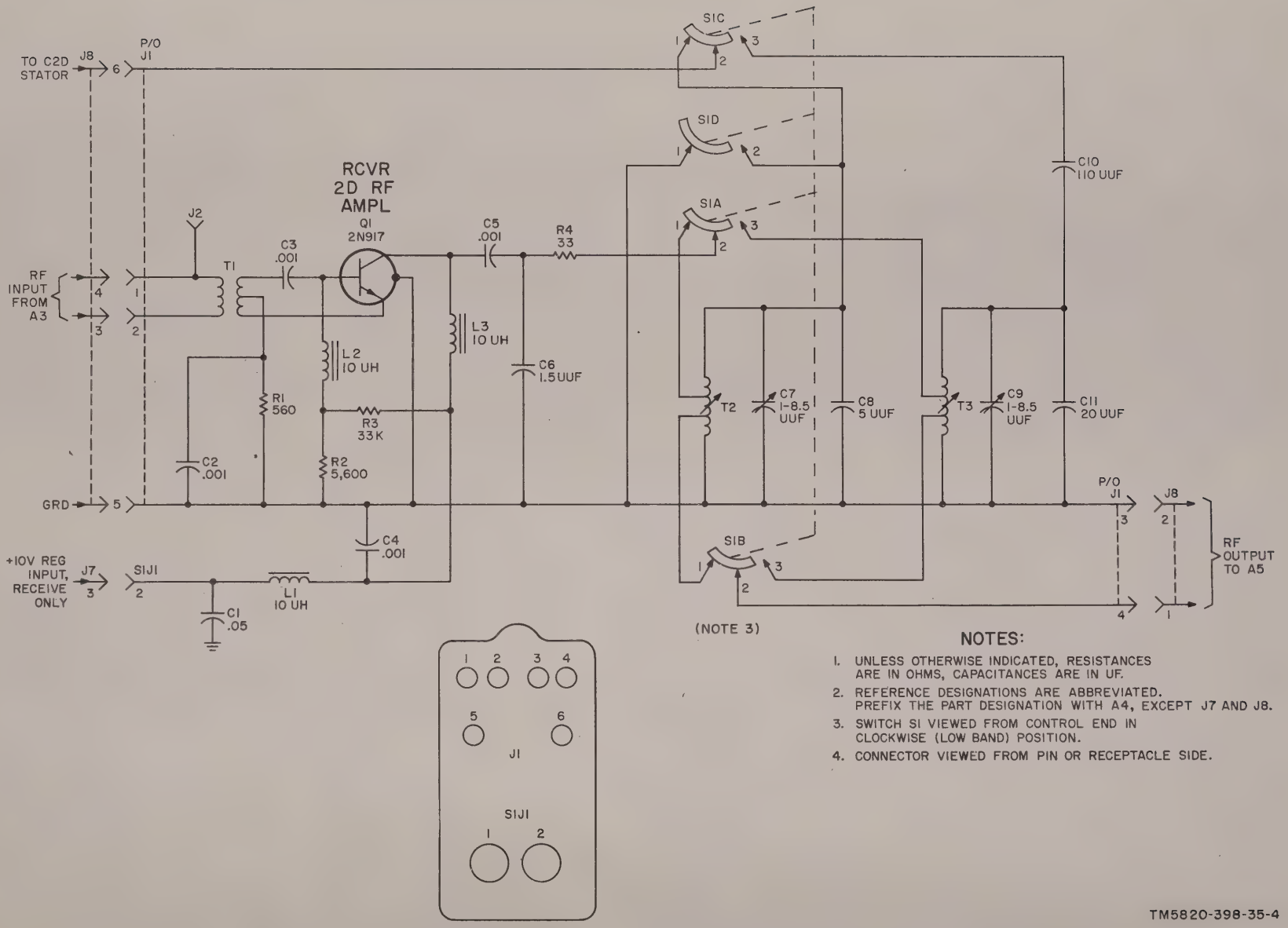


Figure 1. First rf amplifier module A3, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A4, EXCEPT J7 AND J8.
3. SWITCH S1 VIEWED FROM CONTROL END IN CLOCKWISE (LOW BAND) POSITION.
4. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 2. Second rf amplifier module A4, schematic diagram.

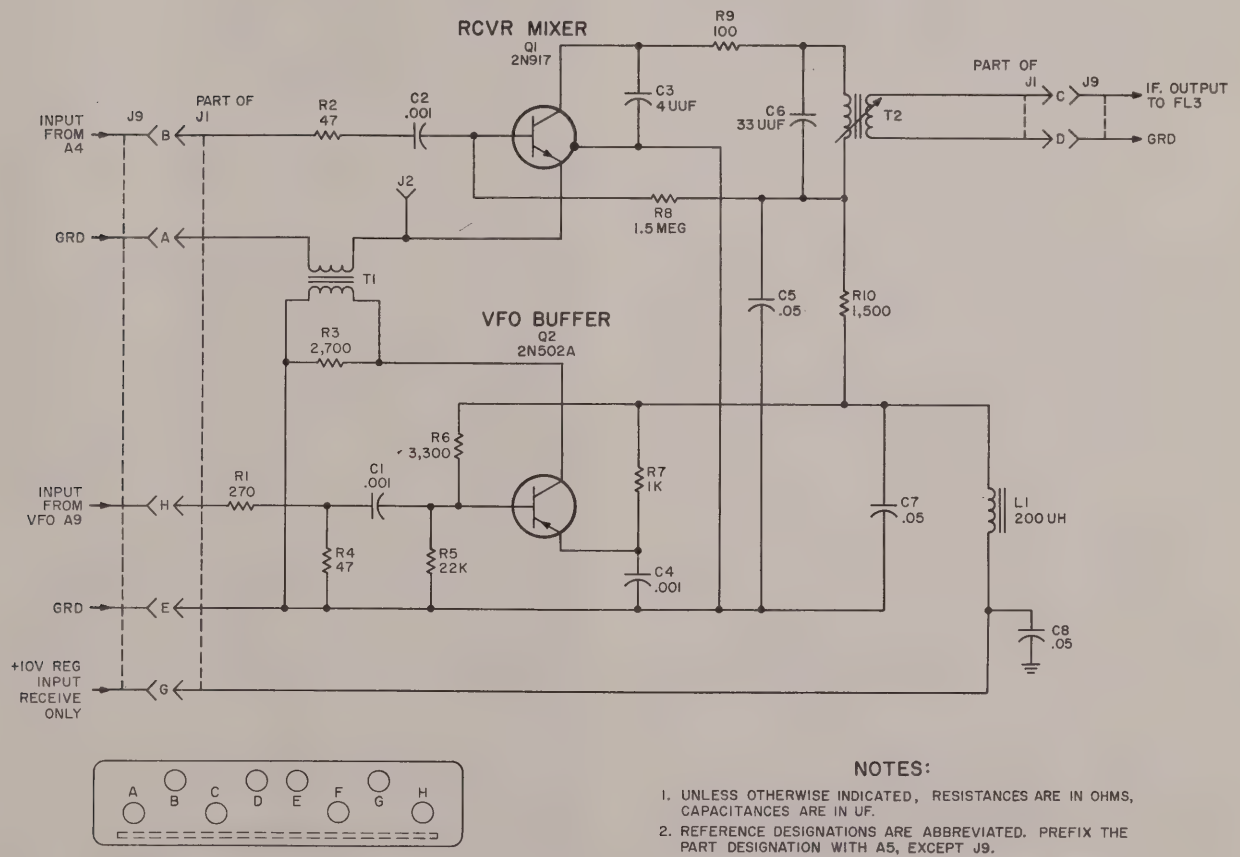
the tuned circuit consisting of capacitor C9 and the primary winding of transformer T1.

(2) The combination of resistors R2 and R3, R7 and R8, and R11 and R12 develops base-to-emitter bias for Q1, Q2, and Q3 respectively. Resistors R4, R9, and R13 are emitter swamping resistors. Capacitors C3, C6, and C8 are emitter rf bypass capacitors for Q1, Q2, and Q3 respectively. Resistors R5 and R10 are collector load resistors for amplifiers Q1 and Q2, respectively. Resistor R6 and capacitor C2 form a decoupling network between the +10-volt circuit of the first if. amplifier and the other stages. The input signal to module A21 can be measured at test jack J3.

b. Receiver Fourth and Fifth If. Amplifiers Q4 and Q5. Transistors Q4 and Q5, amplify the if. signal, and also limit strong signals.

(1) The output of Q4 is developed across collector load resistor R17 and is coupled through capacitor C12 to the base of fifth if. amplifier Q5. The collector output of amplifier Q5 is developed across load resistor R21 and applied through coupling capacitor C15 to the base of receiver discriminator driver Q6.

(2) Resistors R14 and R15, and R18, and R19 develop base-to-emitter bias for Q4 and Q5 respectively. Resistors R16 and R20 are emitter swamping resistors and capacitors C11 and C14 are the emitter bypass capacitors for Q4 and Q5 respec-



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A5, EXCEPT J9.
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 3. Receiver mixer module A5, schematic diagram.

tively. Resistors R17 and R21 are collector load resistors for Q4 and Q5, respectively.

c. Receiver Discriminator Driver Q6. The receiver discriminator driver amplifies and limits the 11.5-mc if. signal output from Q5 and applies a strong signal of constant amplitude to discriminator Z1 (fig. 88).

(1) The 11.5-mc signal from Q5 is coupled through capacitor C15 to the base of Q6. The output of the driver is developed across a tuned circuit consisting of capacitor C18 and the primary of coupling transformer T2. The secondary of transformer T2 and the tuned circuit consisting of capacitor C21 and variable inductor L4 match the output impedance of driver Q6 to the input impedance of discriminator Z1. Resistor R25 and capacitor C19 form a compensating network which improves the response and linearity of the input signal to Z1.

(2) Resistors R22 and R23 develop the base-to-emitter bias for driver Q6. Resistor R24 is the emitter swamping resistor and capacitor C16 is the emitter bypass. Resistor R26 is a filter resistor in the +10-volt supply line. The combination of capacitors C17, C13, and inductor L3 prevent rf leakage into the supply. The output is coupled through capacitor C20 to Z1. The output from T2 can be measured at test point J4.

10. Receiver Audio Amplifier Module A25 (fig. 4)

Receiver audio amplifier module A25 amplifies the audio output from the 11.5-mc discriminator, Z1, and applies it to the handset.

a. The audio output from Z1 is coupled through coupling capacitor C1 to the base of receiver first audio amplifier Q1. The output signal from Q1 is developed across collector load resistor R4 and is coupled through capacitor C4 to VOLUME control R1 on the front panel (fig. 88). This signal is also applied to tone squelch module A24 (para 11). The collector signal of amplifier Q1 is fed back through coupling capacitor C3 and voltage dropping resistor R1 to the base of Q1 to supply a small amount of degenerative feedback to minimize audio distortion, and to prevent discriminator loading by presenting a relatively high input impedance to Z1.

b. The audio signal at the moving contact of the VOLUME control is applied through coupling capacitor C5 and isolation resistor R5 to the base of receiver audio output amplifier Q2. The output signal at the collector of amplifier Q2 is applied to the primary of audio transformer T1. The audio signal is applied from the secondary of T1 to the handset through the contacts of squelch relay K3 (fig. 88).

c. Capacitor C2 is an rf bypass in the input circuit. The combination of resistors R2 and R3 provides fixed base-to-emitter bias for Q1. The combination of resistors R7 and R8 provides fixed base-to-emitter bias for Q2. Resistor R10 is the collector voltage dropping resistor. Capacitor C7 is a bypass capacitor for noise. Resistor R9 is the emitter swamping resistor; capacitor C6 is the emitter bypass capacitor. Resistor R11 presents a constant output impedance to Q2 when function switch S1 (fig. 88) is in the SQUELCH position and there is no incoming signal. The input signal to module A25 can be measured at test jack J3. Resistor R12 isolates the input circuit of transistor Q1 from external loads introduced at test jack J3. The output signal from module A25 can be measured at test jack J4.

d. During transmission, the sidetone audio from module A22 is coupled through capacitor C8 to the input circuit of Q1.

e. Capacitor C11 (in the main frame (fig. 88)) is an rf bypass capacitor on the +10-volt regulated input to module A25.

11. Tone Squelch Module A24 (fig. 5)

a. When the function switch on the front panel is at SQUELCH, +10 volts dc is applied to the tone squelch module. Squelch input amplifier Q1 and squelch emitter fol-

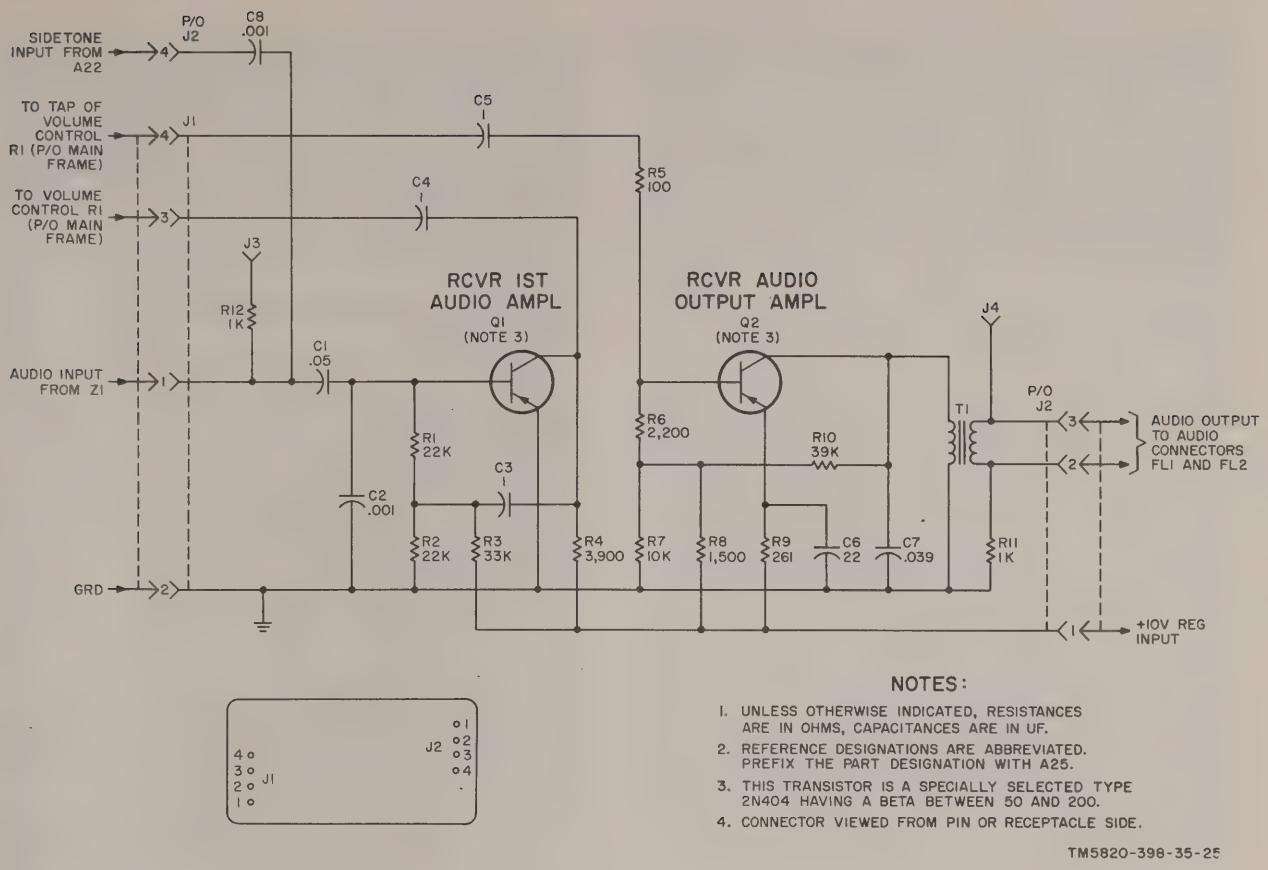


Figure 4. Receiver audio amplifier module A25, schematic diagram.

lower Q2 have a common emitter resistor, R6. Transistor Q2 operates near saturation. Audio input signals from the audio amplifier module are applied through isolation resistor R2, attenuated by dropping resistor R3, and are applied, through coupling capacitor C2 to input amplifier Q1. The audio output signals from Q1 are developed across collector load resistor R7 and directly coupled to the base of squelch feedback amplifier Q3. The audio signals amplified by transistor Q3 are developed across a frequency selective (twin *T*) network which acts as the collector load. Resistors R10 and R11 and capacitor C5 form one *T*; capacitors C3 and C4, and resistor R12 form the other. This network is comparable to an antiresonant circuit; it applies minimum signal voltage to the base of transistor Q2 at the frequency of 150 cps, and maximum signal voltage at other frequencies. The signal applied to the base of Q2 is degenerative to the signal at the emitter of Q1. If the received audio signal is modulated by a 150-cps tone, minimum degenerative signal is applied to the base of Q2. This action reduces the gain of Q1 at all frequencies except 150-cps. The bias applied to the base of Q2 is determined only by the voltage divider consisting of resistors R9 and R13; transistor Q2 will conduct and effectively cut off Q1 by virtue of common emitter coupling across R6. As a result, the bias applied to the base of Q3 through the voltage divider, consisting of resistors R8 and R7 and thermistor RT1, is sufficient to cut off this stage.

b. When the 150-cps tone is present with the incoming signal, the collector output of feedback amplifier Q3, a 150-cps tone signal only, is filtered by the combination of resistor R16 and capacitor C8 and is applied through coupling capacitor C7 to the base of amplifier-detector Q4. With no signal input, the base of transistor Q4 is at ground potential. Only the positive half

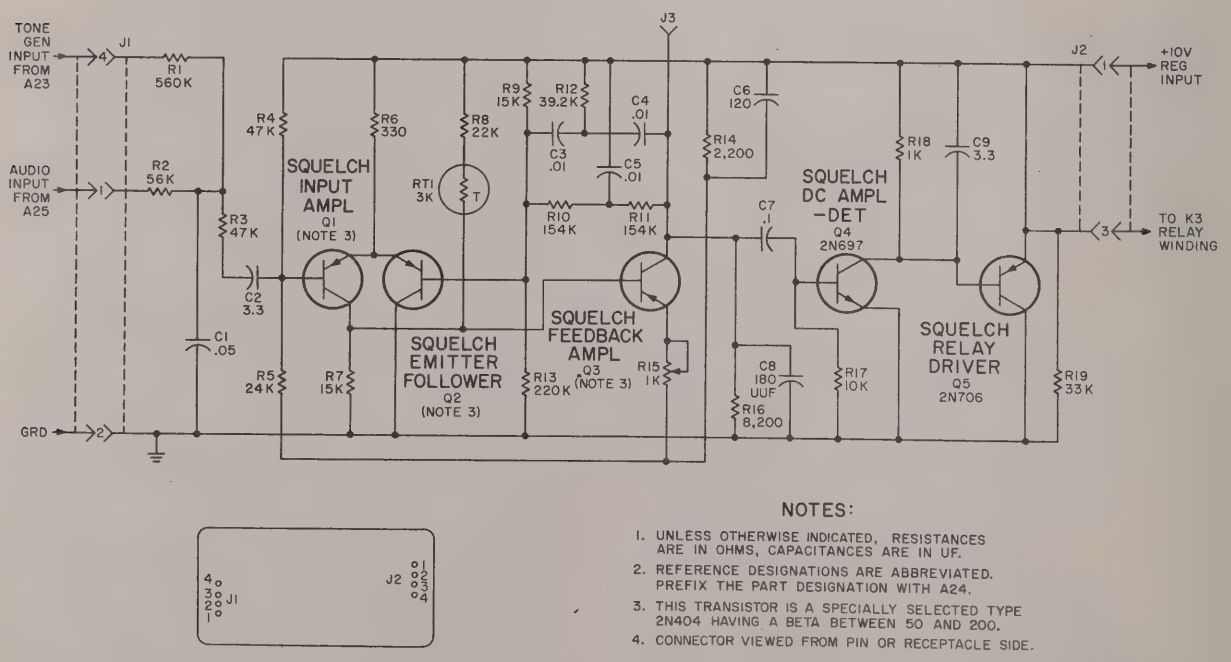
cycles of the 150-cps signal will cause the amplifier-detector to conduct. The output developed across collector load resistor R18 is a negative-going half-wave rectified signal. The output signal is filtered by capacitor C9 and is directly coupled to the base of relay driver Q5. The negative dc signal causes transistor Q5 to conduct, which causes current to flow through the squelch relay winding. When relay K3 energizes, the receiver circuits will operate.

c. Capacitor C1 is a bypass for the higher audiofrequencies. The combination of resistor R14 and capacitor C6 decouples the emitter circuit of transistor Q3 from the +10-volt supply. Potentiometer R15, which is the emitter swamping resistor for transistor Q3, is used to adjust the negative feedback to the base of transistor Q1 through dropping resistor R5 to thereby control amplifier gain. Potentiometer R15 is normally adjusted so that an audio input signal of 35 millivolts minimum causes squelch relay K3 to become energized. The combination of the squelch relay coil and resistor R19 provides emitter operating voltage for relay driver Q5. During transmission, with function switch S1 (mainframe) (fig. 88) at SQUELCH, sidetone audio is applied to the squelch circuit input, while the 150-cps tone is coupled across isolation resistor R1 and superimposed on the sidetone audio signal. This condition permits the operator to hear the sidetone in his handset.

12. Speech Amplifier Limiter Module A22 (fig. 6)

The speech amplifier limiter amplifies the audiofrequency signals from the microphone section of the handset. This module consists of two speech amplifiers and an output limiter stage. The audio output is applied to sidestep oscillator module A20 (para 14) and sidetone output is supplied to receiver audio amplifier module A25 (para 10).

a. Audio signals are coupled through an input matching pad consisting of resistor R1, inductor L1, and capacitor C1 through coupling capacitor C2 to the base of first speech amplifier Q1. The amplified audio output from the collector of Q1 is applied through coupling capacitor C5 to the base of second speech amplifier Q2. The audio signal output from Q2 is applied through



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A24.
3. THIS TRANSISTOR IS A SPECIALLY SELECTED TYPE 2N404 HAVING A BETA BETWEEN 50 AND 200.
4. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 5. Tone squelch module A24, schematic diagram.

coupling capacitor C7 to the base of output limiter Q3. The output limiter signal is developed across collector load resistors R17 and R18. The audio output to A20 (para 14) of the sso is coupled through capacitor C10 while the sidetone output to receiver audio module A25 is directly coupled from the junction of resistors R17 and R18. A 150-cps tone signal from the tone generator module is superimposed on the audio output signal to the sso through isolation resistor R19.

b. Resistors R2 and R3 establish base-to-emitter fixed bias for transistor Q1. Resistor R5 is an emitter swamping resistor for Q1. The combination of resistor R4 and capacitor C4 decouples the emitter circuit from the +10-volt supply. Resistor R6 is the collector load for first speech amplifier Q1. Resistor 11 is the collector load resistor for second speech amplifier Q2. The combination of resistors R7, and R8 and diode CR1 establishes base-to-emitter bias for speech amplifier Q2. Because of the negative temperature coefficient of diode CR1, the bias varies inversely with temperature; therefore, the bias remains constant despite wide variations in temperature. Resistor R10 is the emitter swamping resistor for Q2. The combination of resistor R9 and capacitor C6 decouples the Q2 emitter circuit from any extraneous noise signals. Resistor R11 is the collector load for second speech amplifier Q2.

c. Resistive divider R13 and R14 provides base-to-emitter bias for output limiter Q3. Resistor R16 is the emitter swamping resistor for Q3. The combination of resistor R15 and capacitor C8 decouples the emitter circuit from any extraneous noise signals. The combination of inductor L2 and capacitor C9 decouples the emitter from the +10-volt supply. Resistor R12 is a power supply voltage dropping resistor. Capacitor C22 filters the power supply voltage for transistors Q1 and Q2. The audio output to module A20 can be measured at test jack J3. Capacitor C10 (in the main frame (fig. 88)) is an rf bypass capacitor on the +10-volt regulated input to modules A22 and A23.

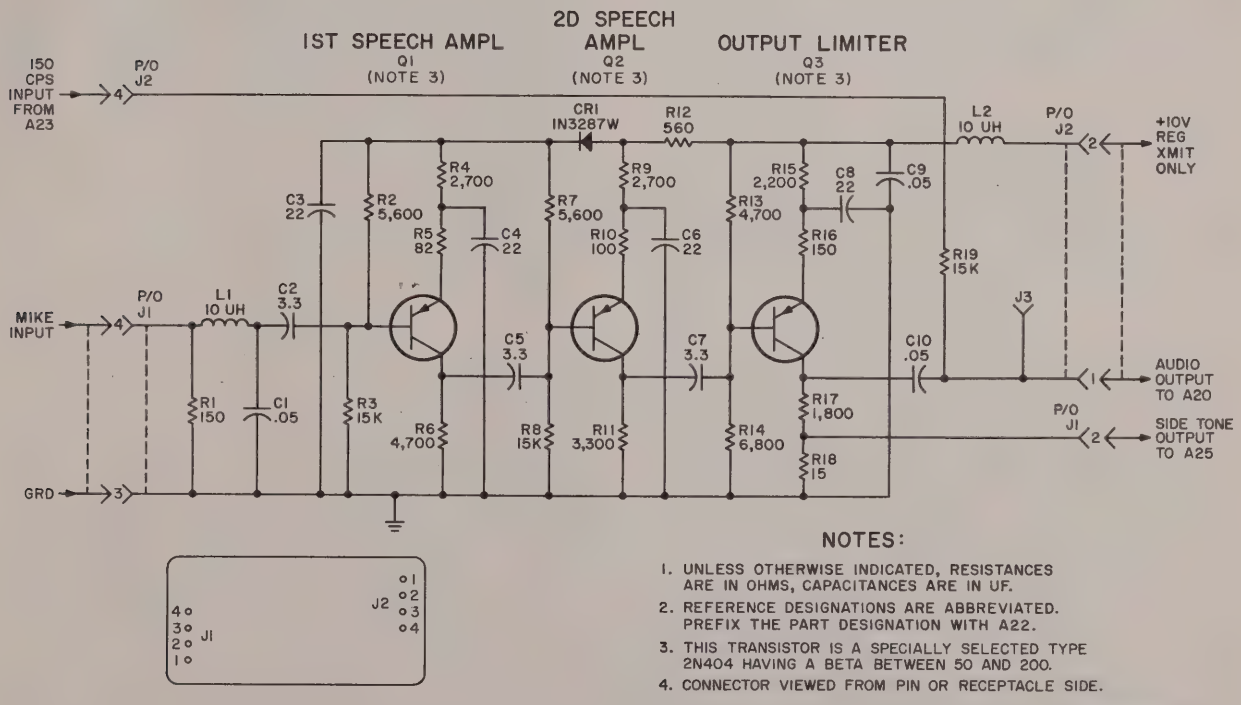


Figure 6. Speech amplifier limiter module A22, schematic diagram.

13. Tone Generator Module A23 (fig. 7)

The tone oscillator functions only during transmission. The 150-cps output tone is applied to the speech amplifier limiter module (para 12) which frequency-modulates the transmitter output carrier signal with the tone at all times during transmission. The 150-cps tone disables the squelch circuit in the distant receiver.

a. During transmission, +10-volt dc operating voltage is applied to transistor Q1 which oscillates at 150-cps. The frequency is determined by the resistance-capacitance (rc) phase-shifting network consisting of capacitors C1, C2, and C3 and resistors R1, R2, and R4. Slight adjustment of the frequency can be made by adjustment of FREQ ADJ potentiometer R3. Oscillation is sustained by a feeding back of the collector output through phase-shifting capacitors C1, C2, and C3, to the base of Q1. Each capacitor shifts the signal 60° to provide the regenerative 180° phase shift. Temperature compensation is achieved by thermistor RT2, which provides a temperature compensated bias on the base of Q1, and thermistor RT1, which compensates the phase-shift network.

b. The feedback amplifier is used to insure maximum output with minimum distortion. A portion of the tone oscillator output signal, from the junction of collector resistor R11 and potentiometer R12, is fed back through resistor R5 to the base of transistor Q1 to stabilize the oscillator gain and prevent distortion due to excessive base drive. The 150-cycle tone output is applied to speech amplifier A22 (para 12) in the transmitter section and to tone squelch amplifier A24 (para 11) in the receiver section.

c. The combination of resistors R6, R7, R5, and RT2 and potentiometer R12 provides base-to-emitter fixed bias for oscillator Q1. Resistor R8 is the emitter swamping resistor for oscillator Q1; R9 is the swamping resistor for Q2. Resistor R9 is the emitter swamping resistor for Q2. Potentiometer R12 is the output level adjustment for the 150-cps tone output. The 150-cps tone output from R12 can be measured at test jack J3.

14. Sidestep Oscillator Module A20 and Quarter-Wave Network Module A19

The sidestep oscillator (fig. 8) is a modified Hartley type. A quarter-wave network (fig. 9) is connected to the oscillator tuned circuit to stabilize the frequency. The

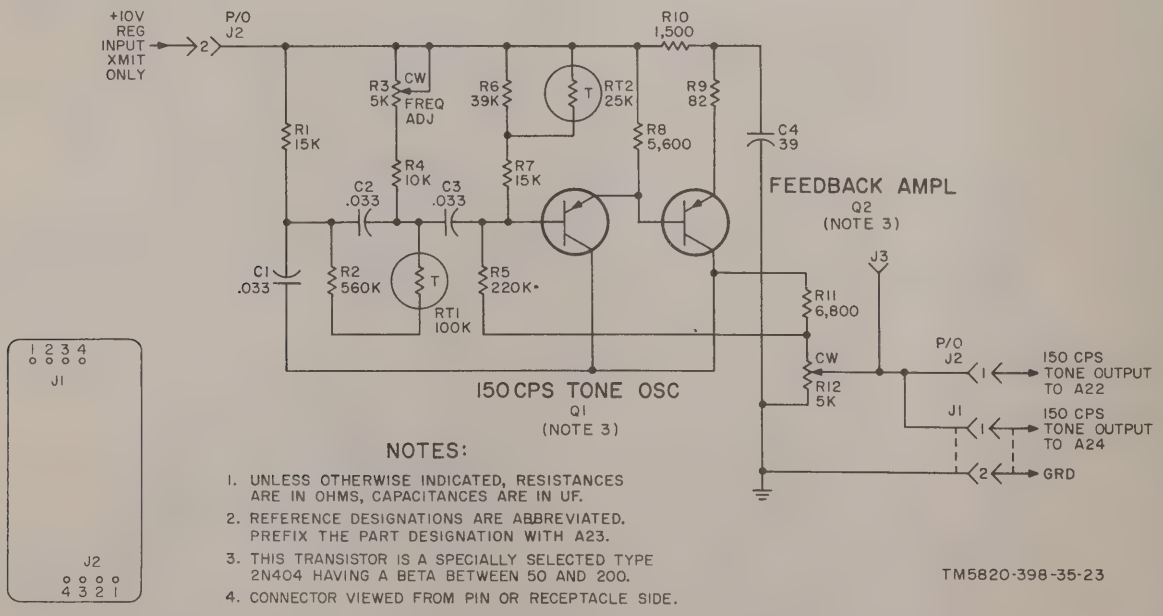


Figure 7. Tone generator module A23, schematic diagram.

network contributes a stability factor about 40 times greater than that of a free-running oscillator.

a. Sidestep Oscillator Module.

(1) The audio signal from speech amplifier limiter module A22 (para 12) is coupled to the sso through coupling capacitor C6 and isolating resistors R8 and R7, across diode CR1. Diode CR1 is a variable capacitance diode. When the audio signal is applied across the diode, the effective capacitance of CR1 changes as the voltage across it varies. These capacitance changes are coupled through capacitor C4, which blocks the audio signal, across the sso tuned circuit consisting of inductor T1 and capacitor C4. The effective capacitance of the tuned circuit, and the output frequency, varies at the audio rate; therefore, the output frequency of the sso is frequency-modulated.

(2) The ac component of the emitter current flows through part of T1, coupling capacitor C1, and swamping resistor R2 to the emitter of Q1. This signal induces an in-phase voltage at the top of T1 which is coupled through coupling capacitor C2 to the base of Q1 to sustain oscillation. Resistors R3 and R4 provide base-to-emitter bias for Q1. Resistor R1 is the emitter load resistor. Resistors R5 and R6 establish a dc bias for CR1. Capacitor C5 is an rf bypass capacitor for the audio input circuit.

(3) The frequency-modulated rf output from the oscillator tuned circuit is coupled from a tap on T1 through capacitor C7 to the base of buffer Q2. The buffer stage isolates the sso from load variations. The buffer output is developed across the tuned circuit consisting of transformer T2 and capacitor C8. Resistors R9 and R10 establish the base-to-emitter bias for Q2. Resistor R11 is the emitter voltage dropping resistor; capacitor C9 is the emitter bypass. A pi-type filter consisting of capacitors C10 and C11 and inductor L1 prevent rf leakage into the +10-volt dc supply. The rf output from Q2 can be measured at test jack J2.

b. Quarter-Wave Network Module A19.

(1) The quarter-wave network is made up of two pi-networks: one for the high band and one for the low band. Each network has a crystal which is used to control the sso frequency. BAND switch S4 (fig. 88) on the front panel selects the proper network.

(2) Each network is an artificial quarter-wave line. An impedance or reactance at one end is reflected as the exact opposite at the other end. This permits the use of a low-impedance crystal with the high-impedance tank circuit in the sso. If the crystal were connected directly into the tuned circuit, deviation of the sso frequency would not be possible. Inductors L1 and L2 are used to control the amount of coupling between the crystal and the tuned circuit.

15. Variable Frequency Oscillator Module A9 (fig. 10)

Variable frequency oscillator (vfo) Q1 functions as the local oscillator during reception and as the master oscillator during transmission. The vfo is a modified Hartley type that generates a signal in the frequency range of 41.45 mc to 64.45 mc. The tank circuit for Q1 receives an automatic phase control (apc) dc voltage from module A11 (para 29). The apc voltage is applied to capacitance diode CR1. The effective capacitance of CR1 varies with the voltage applied to it. Capacitance diode CR1 is connected across the vfo tank. Any vfo output frequency deviation will develop an error signal and cause a change in the apc voltage that will change the effective capacitance of CR1; this condition causes the vfo output to return to its proper frequency. The vfo has outputs to the fss buffer, the receiver mixer, and transmitter mixer. The fss buffer provides gain,

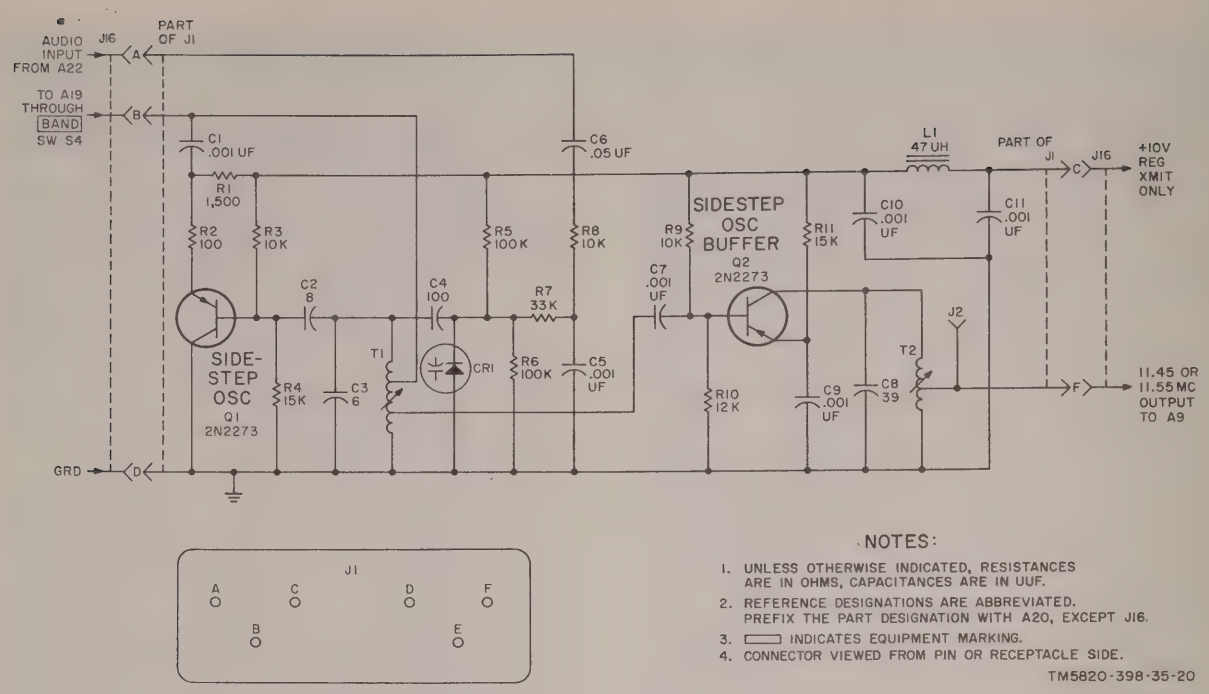


Figure 8. Sidestep oscillator module A20, schematic diagram.

isolation, and proper match for the vfo signal applied to the fss. An output from the vfo is directly fed to receiver mixer A5 (para 8) and heterodyned with the incoming signals to produce the 11.5-mc if. The third vfo output is applied to transmitter mixer Q2.

a. VFO Q1.

(1) Collector-to-emitter feedback through capacitor C2 and inductor T1 maintains oscillation in Q1. The tuned circuit consists of inductor T1, trimmer capacitor C9 fixed capacitor C10, capacity diode CR1, and ganged tuning capacitors C1D C1E which are varied by the tuning controls on the front panel. Trimmer capacitor C8 controls the effect of CR1.

(2) Input error signals from the frequency synthesizer system are applied through a filter network consisting of inductor I4 and capacitor C7, and through isolating resistor R9 to capacitance diode CR1. The capacitance of CR1 varies directly with the applied error voltage to correct the output frequency of the vfo. The automatic phase control voltage from module A11 can be measured at test jack J3.

(3) Resistors R1 and R2 develop the base bias for Q1. Resistor R3 is the emitter swamping resistor. The rf signal at the tuned circuit can be measured at test jack J4.

(4) Capacitor C8 (in the main frame (fig. 88)) is an rf bypass capacitor on the automatic phase control voltage line. Capacitor C9 (in the main frame (fig. 88) is an rf bypass capacitor on the +10-volt regulated input line.

b. Frs Buffer Amplifier Q3.

(1) The output from the vfo is applied through isolation resistor R11 and coupling capacitor C11 to the base of Q3. Transformer T2 couples the output of this stage to the input of the fss.

(2) Voltage-divider resistors R12 and R13 develop the fixed base bias for Q3. Resistor R14 is the emitter swamping resistor. Capacitor C12 is the rf bypass capacitor for the

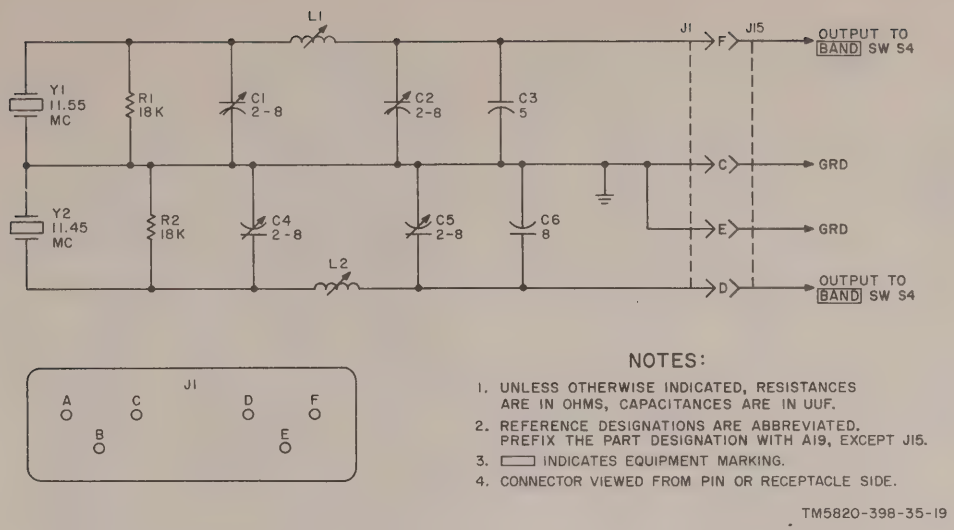


Figure 9. Quarter-wave network module A19, schematic diagram.

emitter. Inductor L3 and capacitor C13 form a filter network to prevent rf leakage into the power supply.

c. Transmitter Mixer Q2.

(1) The transmitter mixer functions only during transmission. The sso input from A20 (para 14) is applied through isolation resistors R8 and R16 and coupling capacitor C3 to the base of Q2. The vfo output is applied through isolating resistors R10 and R16 and coupling capacitor C3 to the base of Q2. Resistor R4 is a dc return. The two signals are heterodyned in this stage; the output from the collector is applied to transmitter first rf amplifier module A8. The collector returns to ground through the primary of T1 in module A8 (para 16).

(2) Voltage divider resistors R5 and R6 develop the fixed bias for Q2. Resistor R7 is the emitter swamping resistor. Capacitor C5 is an emitter rf bypass capacitor for the Q2. Inductor L1 and capacitor C6 form a filter network to prevent rf leakage into the power supply.

16. Transmitter First Rf Amplifier Module A8 (fig. 11)

Transmitter first rf amplifier module A8 amplifies the rf input from variable frequency oscillator module A9 (para 15).

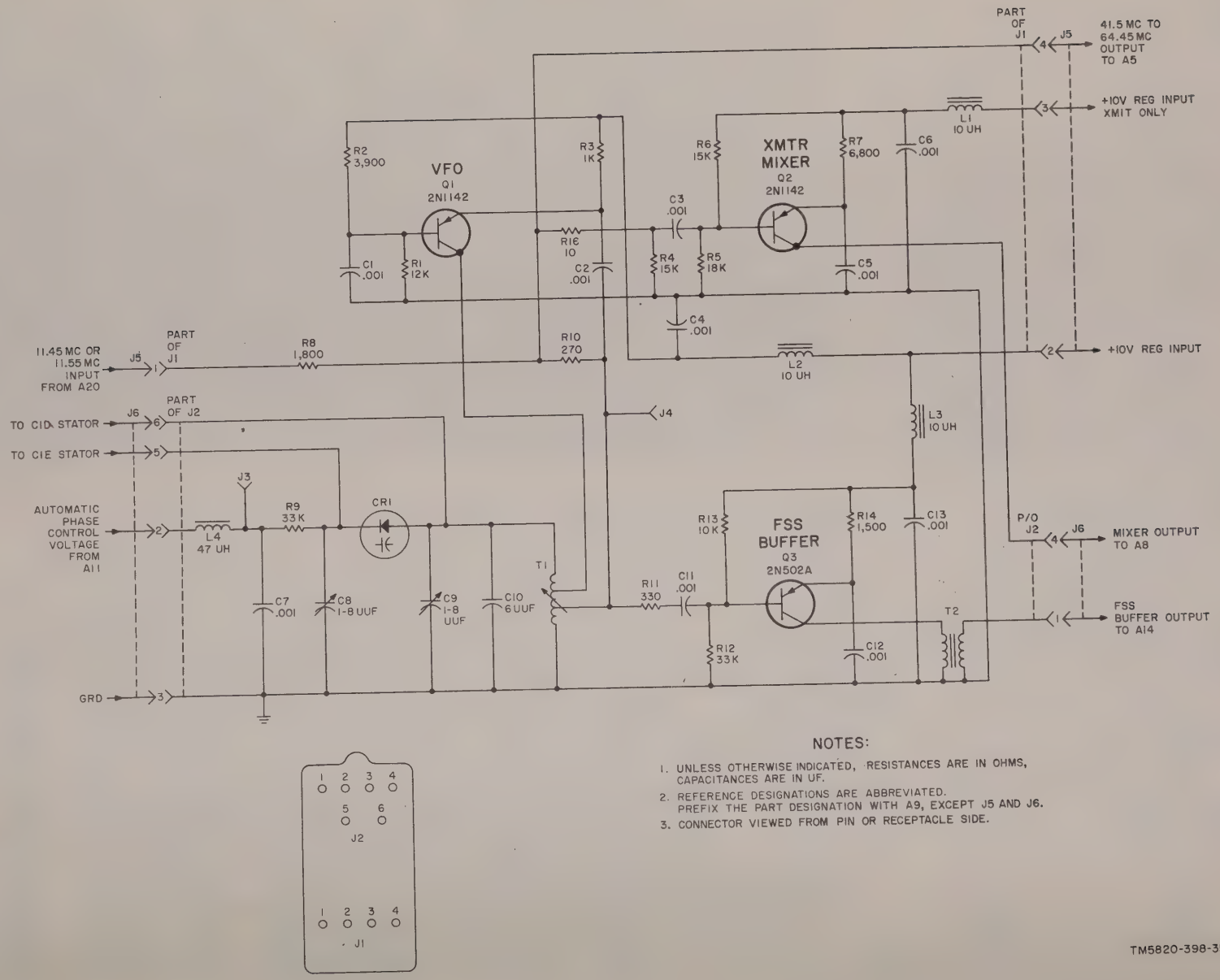
a. The signal from A9 is coupled from the top of the tapped secondary of T1 through coupling capacitor C2 to the emitter of Q1 and from the bottom of the secondary of T1 through coupling capacitor C3 to the base of Q1. The output at the collector is coupled through BAND switch S1B to either the low- or high-band tuned output circuit.

b. Separate tuned output circuits are used for the high and low bands. Switch S1 selects the circuit when the BAND switch on the front panel is positioned.

(1) *Low band.* The low-band tuned output circuit consists of inductor T2, fixed capacitor C7, trimmer capacitor C6, and ganged tuning capacitor C1C (fig. 88).

(2) *High band.* The high-band tuned output circuit consists of transformer T3, fixed capacitor C10, trimmer capacitor C9, and ganged tuning capacitor C1C.

c. Capacitors C4 and C5 and inductor L3 form a filter which prevents rf variations from reaching the -45-volt dc supply. The combination of resistors R2 and R3 provides fixed bias, and resistor R1 is the emitter swamping resistor for Q1. Inductors L1 and L2 are rf chokes. Capacitor C8 is inserted into the high-band output tuned circuitry by S1C to shift the effective range of ganged tuning capacitor C1C by

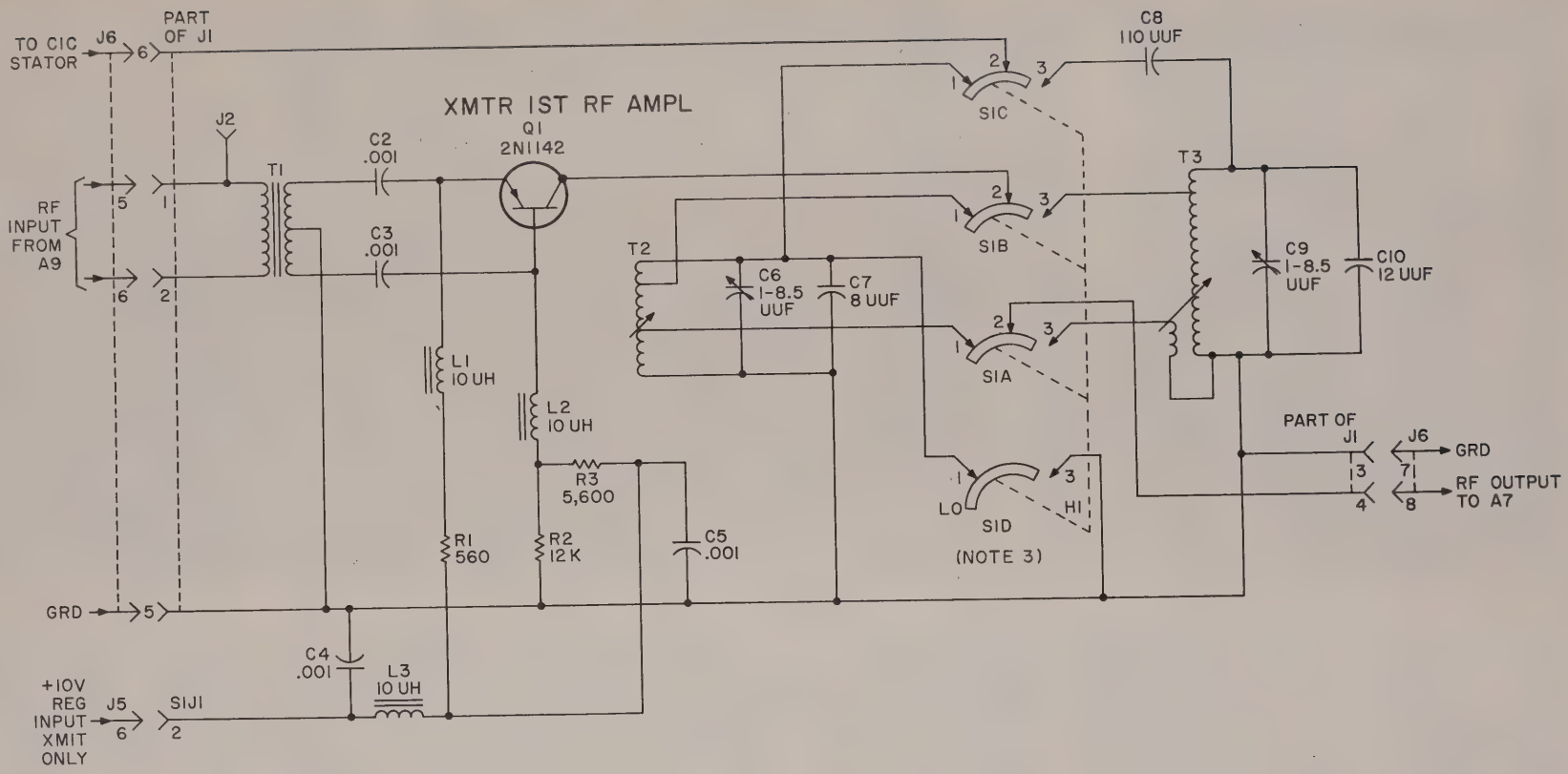


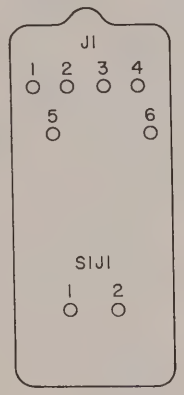
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A9, EXCEPT J5 AND J6.
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

TM5820-398-35-9

Figure 10. Variable frequency oscillator module A9, schematic diagram.





NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A8, EXCEPT J5 AND J6.
3. SWITCH S1 VIEWED FROM CONTROL END IN COUNTERCLOCKWISE ROTATION (LOW BAND).
4. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 11. Transmitter first rf amplifier module A8, schematic diagram.

decreasing the total capacitance. The rf input to module A8 can be measured at test jack J2.

d. Inductor L2 and capacitors C6 and C7 (in the main frame (fig. 88)) form a filter in the +10-volt regulated input to module A8.

17. Transmitter Second Rf Amplifier Module A7 (fig. 12)

Transmitter second rf amplifier module A7 amplifies the signal from transmitter first rf amplifier module A8 (para 16). Module A7 consists of a single transistor amplifier, a BAND switch, and a tuned output circuit.

a. The output signal from A8 is coupled from the top of the center-tapped secondary of T1 through coupling capacitor C4 to the emitter of Q1 and from the bottom of the secondary through coupling capacitor C5 to the base of Q1. The output at the collector is coupled through BAND switch S1A to either the low- or high-band tuned output circuit.

b. Separate tuned output circuits are used for the high and low bands. Switch S1 selects the circuit when the BAND switch is positioned.

(1) *Low band.* The low-band tuned output circuit consists of inductor T3, trimmer capacitor C9, and ganged tuning capacitor C1B (fig. 88), which is varied by the tuning controls on the front panel. The output is applied from a tap on T3 through S1B to A6.

(2) *High band.* The high-band tuned output circuit consists of the primary of transformer T2, fixed capacitor C8, trimmer capacitor C6, and ganged tuning capacitor C1B. The output is applied from the secondary of T2 through S1B to A6.

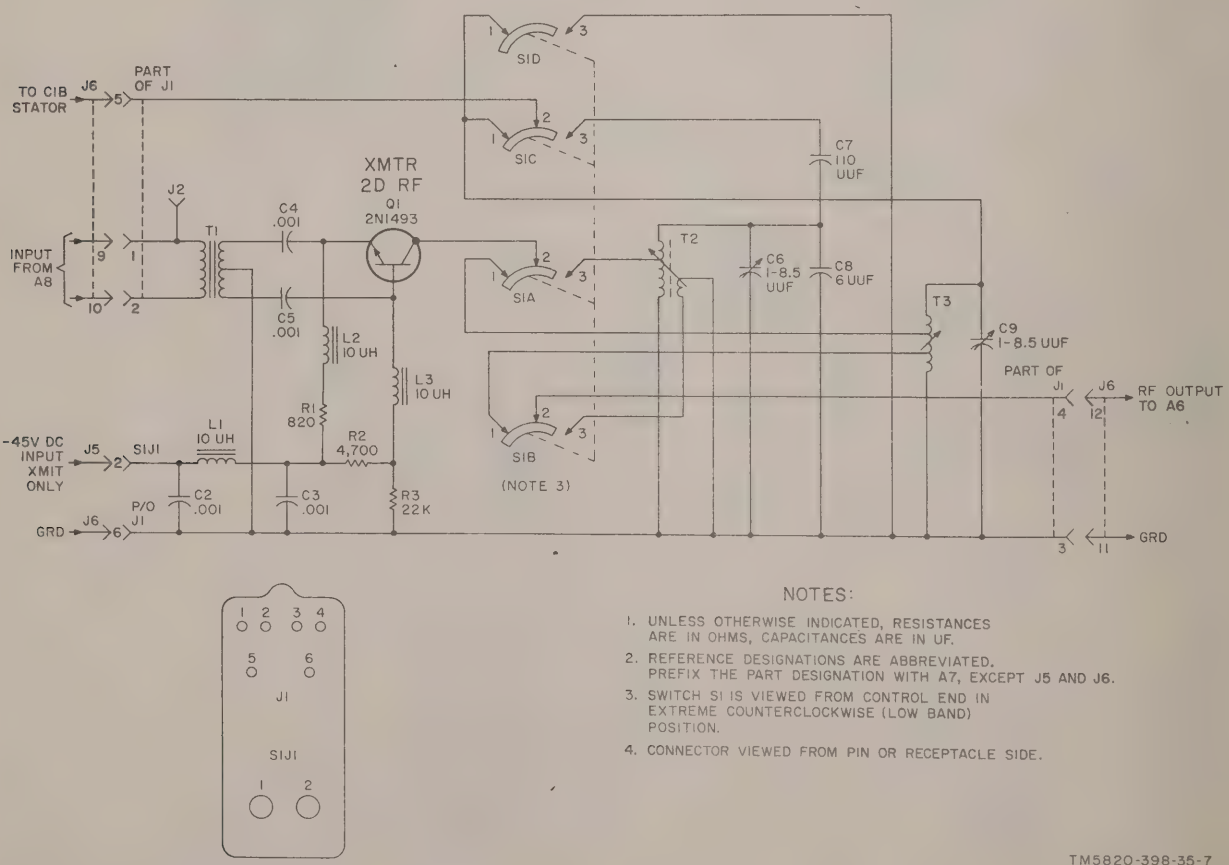


Figure 12. Transmitter second rf amplifier module A7, schematic diagram.

c. Capacitors C2 and C3 and inductor L1 prevent rf variations from reaching the -45-volt dc supply. The combination of resistors R2 and R3 provides fixed bias, and resistor R1 is the emitter swamping resistor Q1. Inductors L2 and L3 are rf chokes. Capacitor C7 is inserted into the high-band output tank circuit by S1C to shift the effective range of ganged tuning capacitor C1B by decreasing the total capacitance. The rf input to module A7 can be measured at test jack J2.

d. Inductor L1 and capacitor C5 (in the main frame (fig. 88)) form a filter in the -45-volt input to module A7.

18. Transmitter Intermediate Power Amplifier Module A6 (fig. 13)

Transmitter intermediate power amplifier module A6 amplifies the rf input from transmitter second rf amplifier module A7 (para 17). The transmitter intermediate power amplifier module consists of a single intermediate power amplifier, a BAND switch, and a tuned output circuit for each of the two bands. The output of A6 is applied to the grid of tube V1.

a. The signal from A7 is coupled from the top of the center-tapped secondary of T1 through coupling capacitor C1 to the emitter of Q1 and from the bottom of the secondary of T1 through coupling capacitor C2 to the base of Q1. The output at the collector of Q1 is coupled through BAND switch S1B to the low- or high-band tuned output circuit.

b. Separate tuned output circuits are used for the high and low bands. Switch S1 selects the proper circuit when the BAND switch is positioned.

(1) *Low band.* The low-band tuned output circuit consists of inductor T2, trimmer capacitor C6, and ganged tuning capacitor C1A (fig. 88), which is varied by the tuning controls on the front panel to select the desired frequency within the low band. The output is applied from a tap of T2 through S1A and coupling capacitor C3 in the main frame (fig. 88) to the grid of V1.

(2) *High band.* The high-band tuned output circuit consists of inductor T3, trimmer capacitor C8, and ganged tuning capacitor C1A. The OUTPUT is applied from a tap of T3 through S1A and coupling capacitor C3 in the main frame (fig. 88) to the grid of V1.

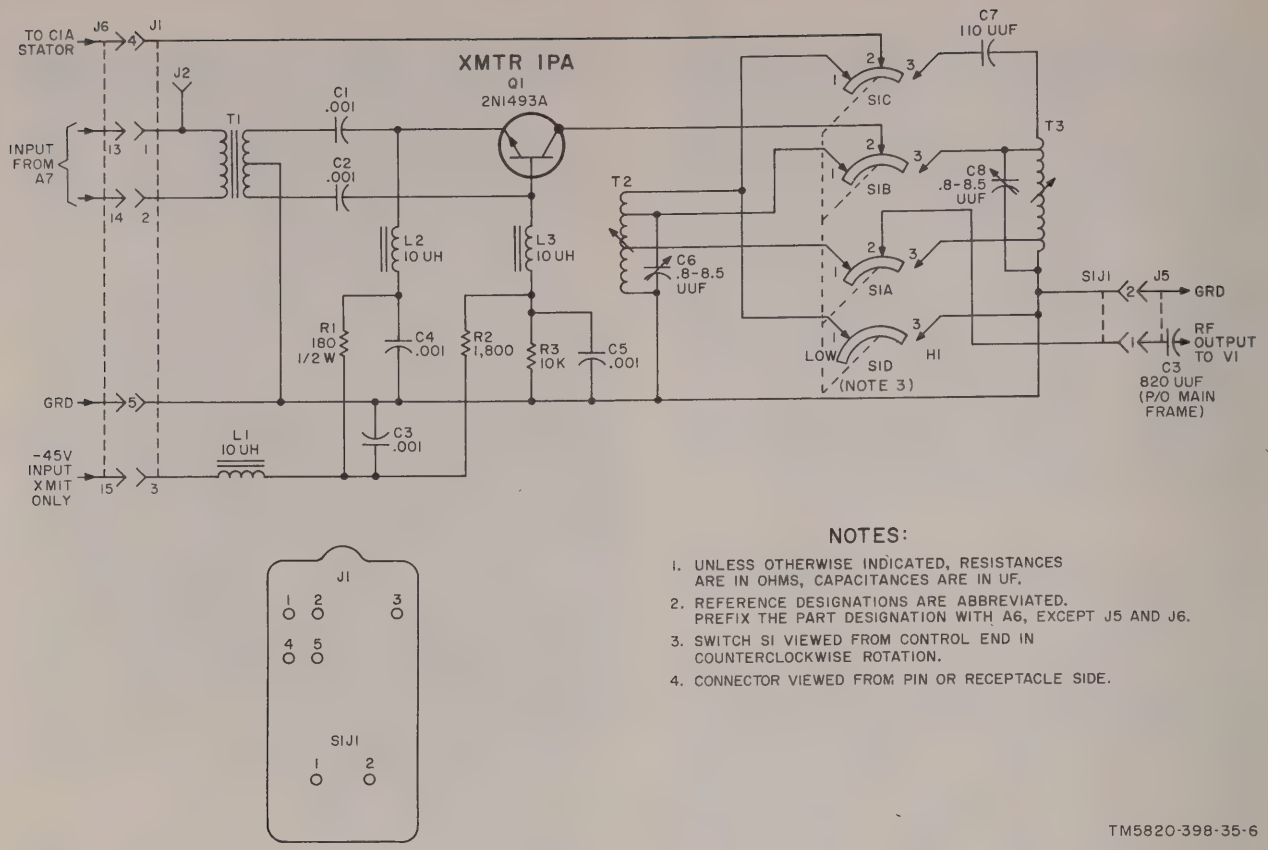
c. The combinations of inductor L1 and capacitor C3, choke rf L2 and capacitor C4, and rf choke L3 and capacitor C5 keep rf variations out of the -45-volt dc supply. Resistor R1 is an emitter swamping resistor. The combination of resistors R2 and R3 form a voltage divider which supplies base bias for transistor Q1. Capacitor C7 is inserted into the high-band output tank circuit by S1C to shift the effective range of ganged tuning capacitor C1A by decreasing the total capacitance. The rf input to module A6 can be measured at test jack J2.

19. Power Amplifier A29 (fig. 14)

Power amplifier A29 is a pentode-type rf amplifier stage which, in conjunction with power amplifier (pa) tank module A2 (para 20), develops the required rf power output to the antenna. Plate, screen-grid, and bias voltages for power amplifier tube V1 are supplied by dc-to-dc converter module A1 (para 31). The dc filament voltage is supplied by battery BT1.

a. The rf input signal from transmitter ipa A6 (para 18) is applied through parasitic suppression network Z1 to the control grid of V1. The rf signal at the plate of tube V1 is developed across the low- or high-band tank circuits located in power amplifier (pa) tank circuit module A2.

b. A bias voltage of -39.5 volts dc is applied to the control grid of tube V1 through resistor R2, inductor L1, and suppressor network Z1. Resistor R1 is a voltage dropping resistor in series with the -45-input circuit. There is a constant voltage drop of approximately 5.5 volts dc across Zener diode CR1 which is applied a fixed grid bias voltage for V1. The combination of inductor L1, resistor R2, and capacitor C1 prevents rf leakage into



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A6, EXCEPT J5 AND J6.
3. SWITCH S1 VIEWED FROM CONTROL END IN COUNTERCLOCKWISE ROTATION.
4. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 13. Transmitter ipa module A6, schematic diagram.

the -45-volt supply. A pi-type filter consisting of capacitors C2 and C5 and inductor L2 prevents rf variations on the filament of tube V2 and rf leakage into the 2.5-volt filament supply. The combination of plate inductor L3 and bypass capacitor C4 prevents rf leakage into the +125-volt power supply. Resistor R3 is a screen-grid voltage dropping resistor; capacitor C3 is the screen-grid bypass capacitor.

20. Power Amplifier Tank Module A2 (fig. 15)

Power amplifier tank module A2 is used as both the output load for power amplifier tube V1 (para 19) (in A29), and as the input circuit for receiver first rf amplifier module A3 (para 6). Module A2 consists of a low- and a high-band tuned circuit, and a BAND switch.

a. BAND switch S1 selects one of two frequency bands. When S1 is in the low-band position (30-52), the tuned circuit consists of transformer T1, trimmer capacitor C1, and inductor L1. When S1 is in the high-band position, the tuned circuit consists of transformer T2, trimmer capacitor C1, and inductor L1. When S1 is in C5. Tuning capacitor C2B (fig. 88) is connected in parallel with either T1 or T2 through S1C.

b. During transmission, the output from transmitter power amplifier tube V1 is applied from J7 through S1AJ1, contact 2 and contact 1 or 3 of S1A to the selected tuned circuits (*a* above). The output signal from the tuned circuit is applied through contact 1 or 3 and contact 2 of S1D, through terminal 1 of 2AJ1 and terminal 11 of J7 to the antenna. Input to the receiver through S1B is prevented by the energized contacts of relay K1 (fig. 88). During reception, signals from the antenna are passed through S1D to the selected tuned circuit. Relay K1 (fig. 88) is not energized. During reception, energy from the tuned circuit is coupled by inductor

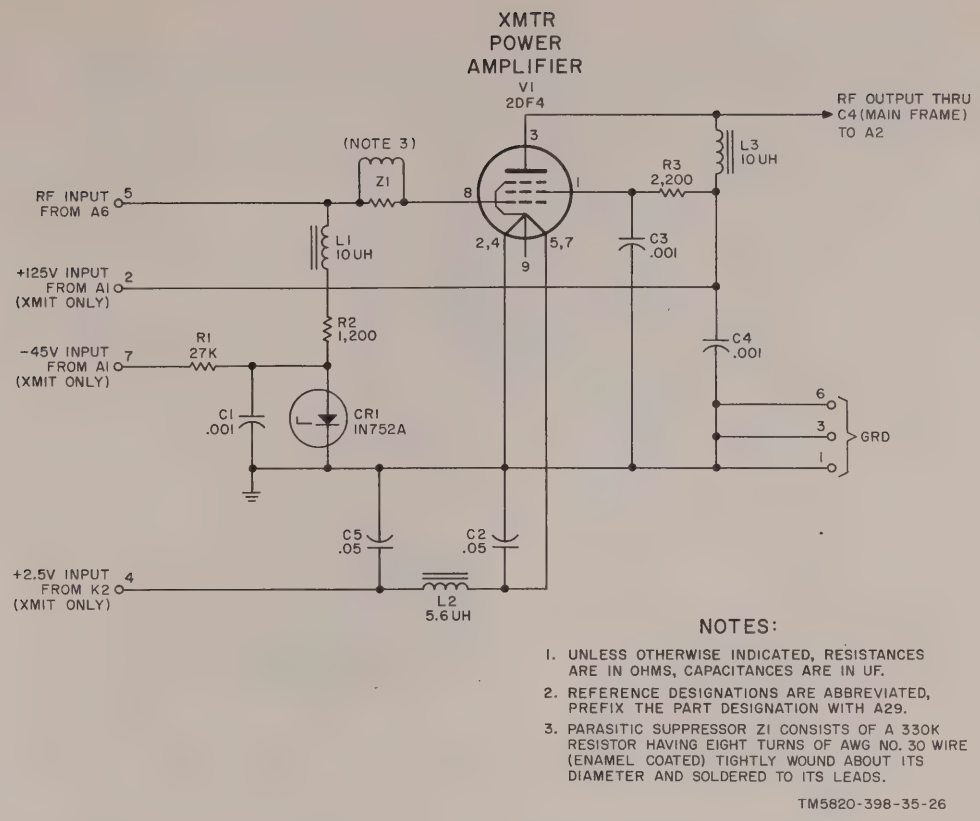


Figure 14. Power amplifier A29, schematic diagram.

L1 (low band) or capacitor C4 (high band) through switch S1B, through pin 3 of 2AJ1 and pin 9 of J7 to receiver first rf amplifier module A3.

c. On the low-band tuned circuit, the slug in transformer T1 is an alignment adjustment for the low frequency end, while capacitor C1 is an alignment adjustment for the high frequency end. Inductor L1 provides high-impedance coupling for the receiver to minimize effects of lead length and to reduce spurious responses and radiations.

d. On the high-band tuned circuit, the slug in transformer T2 is an alignment adjustment for the low frequency end, while capacitor C2 is an alignment adjustment for the high frequency end. Capacitor C4 provides high-impedance coupling for the receiver on the high band. Capacitor C5, in conjunction with capacitor C4, provides the proper impedance matching to the receiver. Capacitor C3 is connected in series with C2B by S1C to reduce the ratio of capacitance change on the high band.

21. Antenna Loading Network A28 (fig. 16)

The antenna loading network matches the short or long antenna to the receiver-transmitter by means of tuned coils and switching assemblies.

a. When the long antenna is used, a plunger and a leaf spring engages microswitches S2 and S3, closing contacts 2 and 3 on each switch. The rf signal is applied through contacts of BAND switch S1 to the power amplifier tank (C2A stator) (fig. 88). Inductor L4 is inserted in parallel to change the electrical length of the antenna during operation in the low band.

b. When the short antenna is used, microswitches S2 and S3 are not actuated. The rf signal from the antenna is applied directly to switch S1. When the short antenna is used inductor L4 is not connected.

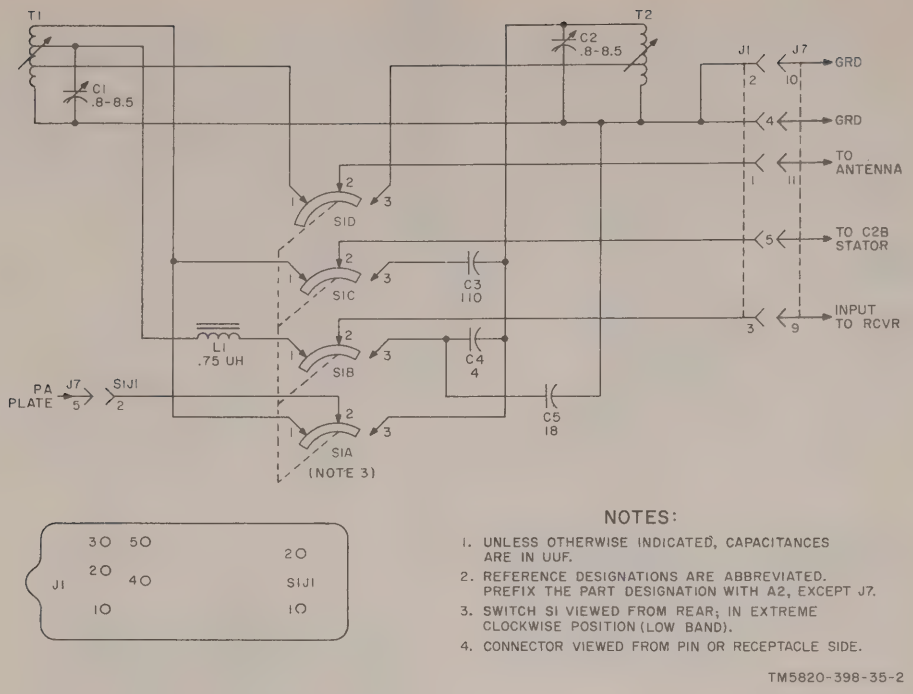


Figure 15. Power amplifier tank module A2, schematic diagram.

c. The tuning controls tune inductors L1, L2, and L3, which are in series with capacitors C2, C1, and C3, respectively, to resonate the antenna in the low and high bands. When the BAND switch is in the low position, inductor L3 and capacitor C3 are placed in the circuit; when the BAND switch is in the high position, inductors L1 and L2 and capacitors C2 and C1 are placed in the circuit.

22. Frequency Synthesizer System First Mixer Module A14 (fig. 17)

The fss first mixer module, A14, heterodynes the output of vfo module A9 (para 15) with the output of 1-mc spectrum generator module A15 (para 23) to produce a band of frequencies around 53 mc. This output is supplied to the 53-mc filter A13 (para 25). The fss first mixer contains the fss first buffer amplifier and a mixer circuit.

a. Fss First Mixer Buffer Q1.

(1) Fss first mixer buffer Q1 provides isolation and low-power gain. It has sufficient bandwidth to pass the 41.45-mc to 64.45-mc output of the fss buffer in A9. The combination of resistors R1 and R2 plus the input impedance to Q1 provides the proper termination for the vfo buffer amplifier. Capacitor C1 is a coupling capacitor. The amplifier output of Q1 is coupling capacitor. The amplified output of Q1 is coupled to the fss first mixer transformer T1. Resistor R6 increases the frequency response of T1.

(2) Resistors R3 and R4 form a voltage divider which develops the fixed portion of the emitter-to-base bias for transistor Q1. Resistor R5 is the emitter swamping resistor. Capacitor C2 is an rf bypass capacitor for the emitter of Q1.

b. The signal inducted to the secondary windings of transformer T1 is coupled through push-pull diodes CR1 and CR2 to the tuned primary of transformer T2. Capacitor C3 and the primary of transformer T2 form a tuned circuit. The input from 1-mc spectrum generator A15 is applied through a pulse-shaping network, consist-

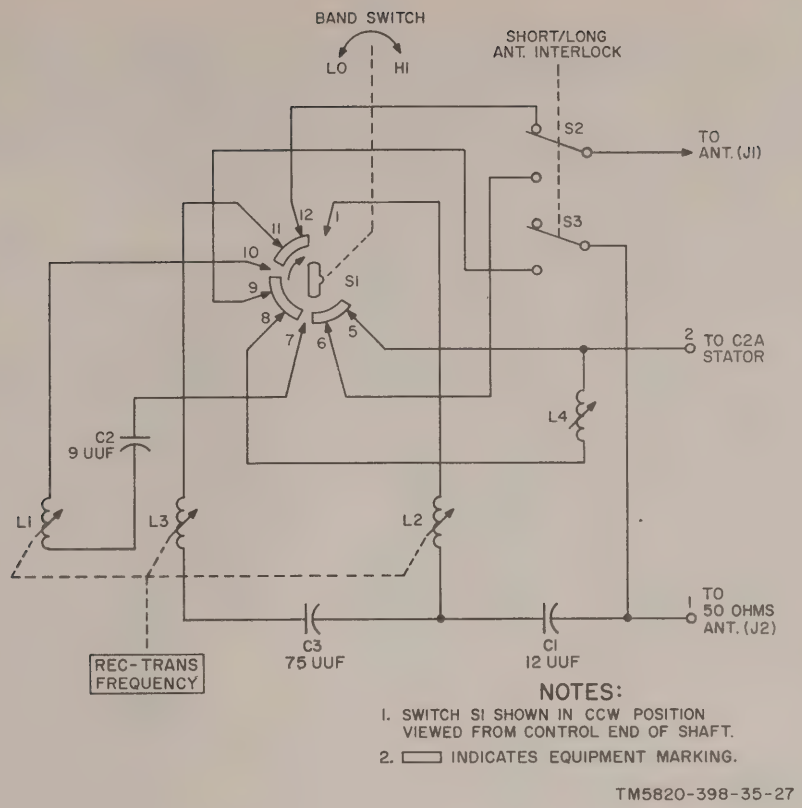


Figure 16. Antenna loading network A28, schematic diagram.

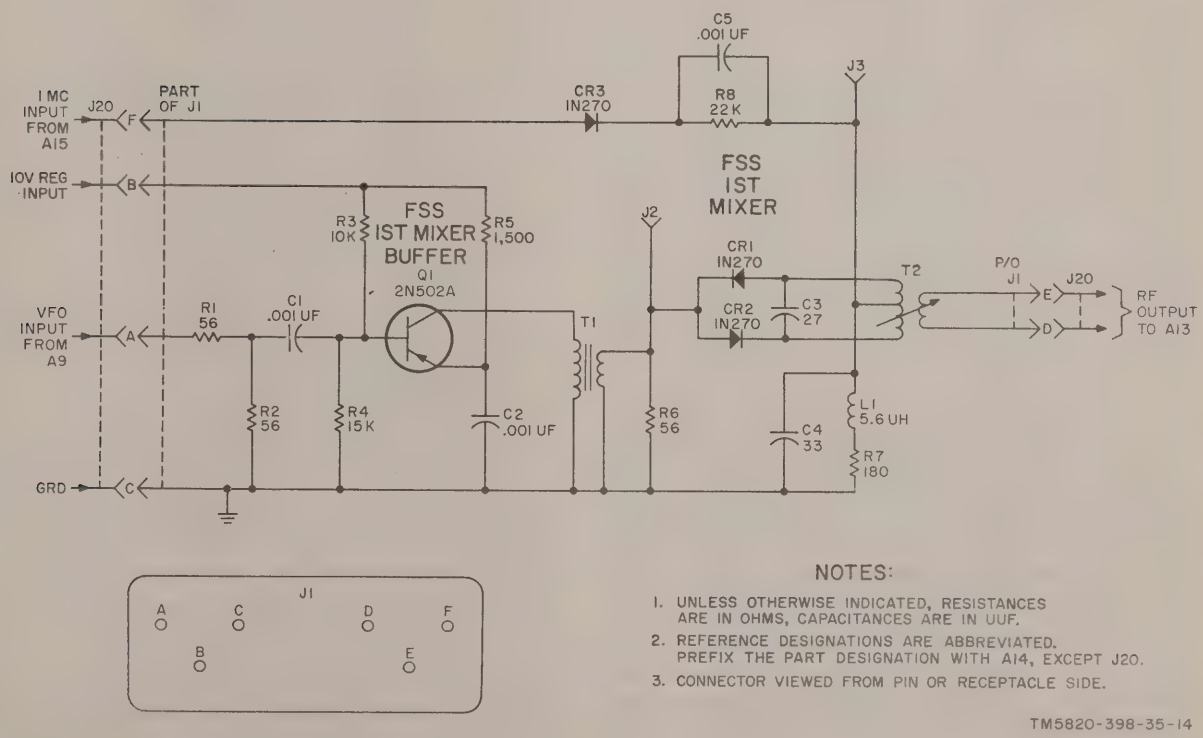


Figure 17. First mixer module A14, schematic diagram.

ing of diode CR3, capacitor C5, and resistor R8, to the center tap of the primary of transformer T2. It is terminated in a tuned network consisting of capacitor C4, inductor L1, and resistor R7. The network is broadly tuned to 7 mc. The spectrum generator output contains the 1st through the 12th harmonic of the fundamental 1-mc pulse. Since the signal level of each succeeding harmonic is reduced in amplitude from the signal level of the preceding harmonic, the terminating tuned network is used to equalize the harmonic components of the generated spectrum.

c. The mixed signal in the secondary of transformer T2 is approximately 53 mc. The output of the fss first mixer is applied to 53-mc filter A13. The rf signal input from Q1 to the fss mixer can be measured at test jack J2. The rf input from module A15 to the fss mixer can be measured at test jack J3.

23. 1-Mc Spectrum Generator Module A15 (fig. 18)

The 1-mc spectrum generator module, A15, produces harmonics of the 1.0-mc crystal-controlled oscillator for injection into fss mixer module A14 (para 22). Module A15 consists of a 1-mc cyrstal oscillator and a pulse generator.

a. The 1-mc crystal oscillator is a modified Hartley type. Transistor Q1, fixed capacitor C2, coil T1, and crystal Y1 form the oscillator circuit. Resistors R1 and R2 form a voltage divider which provides the fixed bias portion of emitter-base bias. Resistor R3 is the emitter swamping resistor for Q1. Capacitor C1 bypasses the base to ground.

b. The sinusoidal 1-mc oscillations are applied to pulse generator Q2 through coupling capacitor C3. The pulse generator is normally cut off by the reverse base bias applied through R4, and conducts only on the negative half cycles of the 1-mc signal. a positive pulse, rich in harmonics, is developed in the collector output. This output is applied across the transformer T2 and coupled to first mixer module A14.

c. Capacitor C5 broadly tunes output transformer T2 to 7 mc. Capacitor C4 is an emitter bypass. Resistor R5 is the emitter swamping resistor for Q2. The 10-volt dc supply is decoupled from the 1-mc spectrum generator by coil L1 and capacitor C6.

24. Interval Oscillator Module A10 (fig. 19)

Interval oscillator module A10 supplies the fss with two crystal-controlled signals. This module has two crystal-controlled oscillators; Q1, generates frequencies of 46.85 mc to 47.75 mc in 100-kc increments, and Q2 generates frequencies of 5.55, 5.60, and 5.65 mc.

a. 46.85- 47.75-Mc Oscillator Q1.

(1) Transistor Q1 is connected in a crystal-controlled oscillator that uses 1 of 10 crystals. Crystal selection is determined by the kc tuning control on the front panel. The toned collector circuit is composed of capacitors C1 and C2 and the primary of transformer T1. Oscillation is sustained by feeding back part of the energy in the collector tank through capacitor C3 and resistor R2. Resistor R4 is the tuned circuit damping resistor.

(2) Resistors R1 and R2 form a voltage divider network which develops the base bias for Q1. Resistor R3 is the emitter swamping resistor. Resistor R18, inductor L1, and capacitor C16 form a filter network in the +10-volt supply to Q1. The rf output of Q1 can be measured at test jack J2.

b. Oscillator 5.55, 5.60, or 5.65 Mc Q2.

(1) Transistor Q2 is connected in a crystal-controlled oscillator circuit that uses one of four crystals (three frequencies) to generate the frequency reference for phase comparison in module A17. The tuned collector circuit is made up of capacitors C9 and C10 and the primary of transformer T2. Oscillation is sustained by feeding back part of the energy in the collector circuit from the junction of C9 and

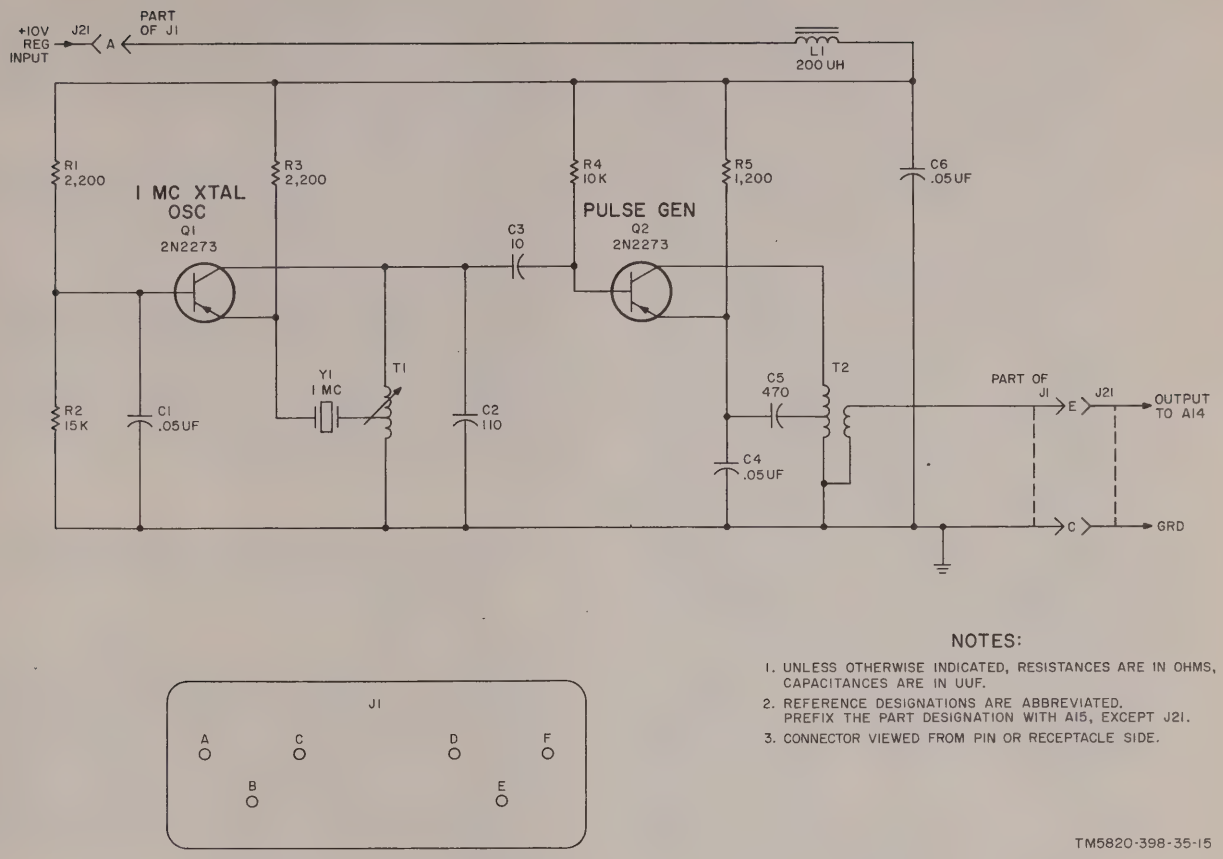


Figure 18. 1-mc spectrum generator module A15, schematic diagram.

C10 to the selected crystal ((2) below), and the contacts of S1A to the emitter of Q2; this action completes the regenerative circuit.

(2) Crystal selection is determined by the operating mode (received or transmit) and by the frequency selected by the kc tuning control. When the RT-505/PRC-25 is in the receive mode, +10 volts is applied through normally closed contacts 4 and 6 of front-end relay K1 (fig. 88), through pin E of connectors J12 and A10J1, and current-limiting resistor R5 to the anode of CR1. This positive voltage forward biases CR1; the diode conducts heavily and allows the regenerative circuit to crystals Y11 and Y12 to be completed. If the RT-505/PRC-25 is operating on a 100-kc channel (31.10 mc, 74.20 mc, etc), S1A will be in the position shown and crystal Y11 (5.65 mc) will be selected through contacts 8 and 11 of S1A; this action completes the regenerative circuit to the emitter of Q2. If the RT-505/PRC-25 is operating on a 50-kc channel (31.15 mc, 74.25 mc, etc.), S1A will be turned clockwise one position from that shown and crystal Y12 (5.60 mc) will be connected through contacts 8 and 9 of S1A; this action completes the regenerative circuit to the emitter of Q2.

(3) When the RT-505/PRC-25 is in the transmit mode, front-end relay K1 (fig. 88) is energized, contacts 4 and 6 open, and +10 volts is no longer available for diode CR1. The diode is now reverse-biased and prevents the selection of crystal Y11 or Y12. Relay K1 contacts 4 and 7 are closed and apply +10 volts through pin K of connectors J12

and A10J1 and current-limiting resistor R7 to the anode of CR2. This positive voltage forward biases CR2; the diode conducts heavily and allows the regenerative circuit to crystals Y13 and Y14 to be completed. If the RT-505/PRC-25 is operating on a 100-kc channel (31.0 mc, 74.20 mc, etc), S1A will be in the position shown and crystal Y13 (5.60 mc) will be selected through contacts 8 and 11 of S1A to complete the regenerative circuit to the emitter of Q2. If the RT-505/PRC-25 is operating on a 50-kc channel (31.15 mc, 74.25 mc, etc), S1A will be turned clockwise one position from that shown and crystal Y14 (5.55 mc) will be selected through contacts 8 and 9 of S1A to complete the regenerative circuit to the emitter of Q2.

(4) Capacitor C7 is an rf bypass capacitor. Capacitor C8 is a coupling capacitor between the base and collector circuit. Resistors R10, R11, and R12 develop fixed bias; resistors R8 and R9 are emitter swamping resistors for Q2.

c. Buffer Q3.

(1) The output from oscillator Q2 is coupled through transformer T2 to the base and emitter of Q3. The buffer isolates Q2 from any varying loading effects.

(2) Resistors R14, R15, and R16 develop fixed-base bias. Resistor R13 is the emitter swamping resistor. Capacitors C11, C12, and C13 are rf bypass capacitors. Inductor L2 and capacitor C15 form a decoupling network to prevent rf leakage into the power supply. The rf output from Q3 can be measured at test jack J3.

25. 53-Mc Filter A13 (fig. 20)

The 53-mc filter has two input signals.

a. The output signal from 100-kc interval oscillator module A10 is coupled through isolation resistor R1 and a matching network consisting of capacitors C6 and C7 and transformer T3 to fss second mixer module A12 (para 26). This circuit minimizes spurious frequency injection into the second mixer.

b. The 53-mc signal from first mixer module A14 is coupled to the filter through transformer T1 to a triple-tuned network. The three tuned circuits are the secondary of T1 and C1, L1 and C3, T2 and C5. Capacitors C2 and C4 are coupling capacitors. This triple-tuned network provides a 2-mc bandpass at the 3-decibel (db) points. The output of this network is coupled to second mixer module A12.

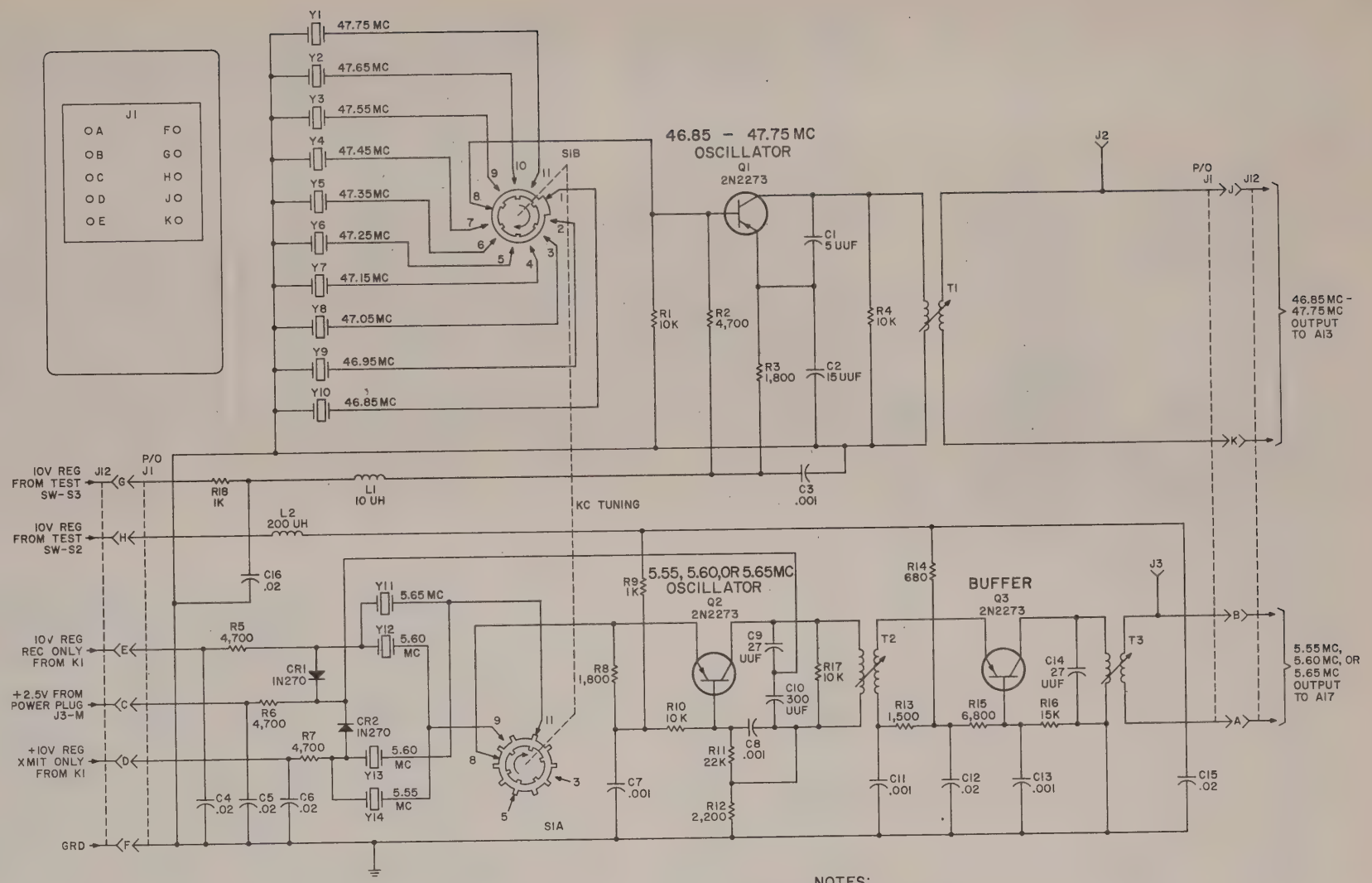
26. Frequency Synthesizer System Second Mixer Module A12 (fig. 21)

The fss second mixer module heterodynes the output from 53-mc filter A13 (para 25), with the 46.85-mc to 47.75-mc output of the 100-kc interval oscillator (applied through A13) to produce an fss if. of 5.55, 5.60, or 5.65 mc. This output is applied to fss if. amplifier module A18 (para 27).

a. The 53-mc input from module A13 is coupled through capacitor C1 to the base of Q1. The 46.85-mc to 47.75-mc input from A13 is coupled through capacitor C2 to the emitter of Q1. Transistor Q1 heterodynes these two input signals; the resultant output signals at the collector of Q1 are applied to the frequency selective network.

b. The frequency selective network is composed of capacitors C4 through C7, variable transformers T1 and T2, and variable inductors L1 and L2. The outputs from Q1 are the two original frequencies plus their sum and difference. The frequency selective network passes only the difference frequency. The network is a bandpass filter having a flat characteristic resonant frequency of 5.6 mc.

c. Resistor R5 and capacitor C3 filter rf signals from the +10-volt dc supply. Resistors R1 and R2 provide the fixed-base bias. Resistor R3 is the emitter swamping resistor. Resistors R4 and R6 terminate



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. SWITCH SHOWN IN 30 MC POSITION, REAR VIEW OF WAFER (LOOKING INTO REAR FACE OF FRONT PANEL).
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE PART DESIGNATION WITH A10, EXCEPT J12.
4. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 19. Interval oscillator module A10, schematic diagram.

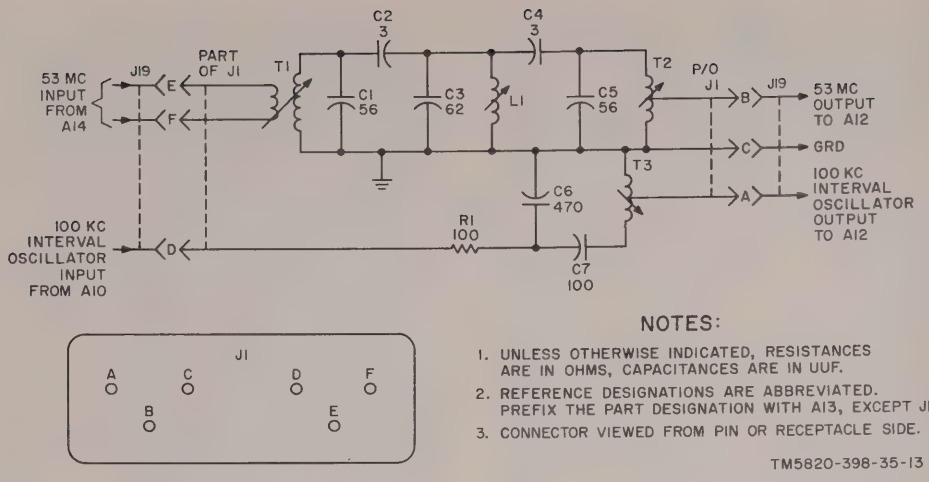


Figure 20. 53-Mc filter module A13, schematic diagram.

the filter properly and minimize variations due to the varying impedances of transistors. The rf output of module A12 can be measured at test jack J2.

27. Frequency Synthesizer System If. Amplifier Module A18 (fig. 22)

The fss if. amplifier module (A18) amplifies the 5.6-mc signal input from fss second mixer module A12 (para 26) and applies it to fss discriminator driver module A11 (para 29) and phase comparator module (para 28) A17. The fss if. amplifier circuit consists of two cascaded, double-tuned, transformer-coupled amplifier stages. The signal amplitude applied to the fss if. amplifier is sufficient to cause limiting.

a. First If. Amplifier Q1.

(1) The 5.6-mc if. signal from module A12 is coupled through capacitor C1 to the base of Q1. The signal output is developed across the tuned collector circuit, consisting of variable inductor L1 and capacitor C3. Resistor R4 broadens the frequency response of the tuned circuit. The signal developed across this tuned circuit is coupled through capacitor C4 to a second tuned circuit consisting of capacitor C5 and the primary of tuned coupling transformer T1. The center-tapped secondary winding of transformer T1 neutralizes Q2 (*b* below).

(2) Resistors R1 and R2 form a voltage-divider network to develop the fixed-bias portion of the emitter-to-base bias of of Q1. Resistor R3 stabilizes the emitter current. Capacitor C2 is an rf bypass capacitor for the Q1 emitter.

b. Second If. Amplifier Q2.

(1) The amplified 5.6-mc signal from transistor Q1 is applied from the secondary of transformer T1 through coupling capacitor C6 to the base of Q2. The signal output is developed across the tuned collector circuit consisting of variable conductor L2 and capacitor C8. The signal developed across this tuned circuit is then coupled through capacitor C9 to the second tuned circuit, consisting of capacitor C10 and the primary of transformer T2.

(2) Resistors R6 and R7 form a voltage-divider network which develops the fixed-bias portion of the emitter-to-base bias of Q2. Resistor R5 stabilizes the emitter current. Capacitor C7 is a bypass capacitor for the top of transformer T1. Resistor R8 is a load for the tuned circuit. Resistor R10, across the secondary of transformer T2, provides the proper

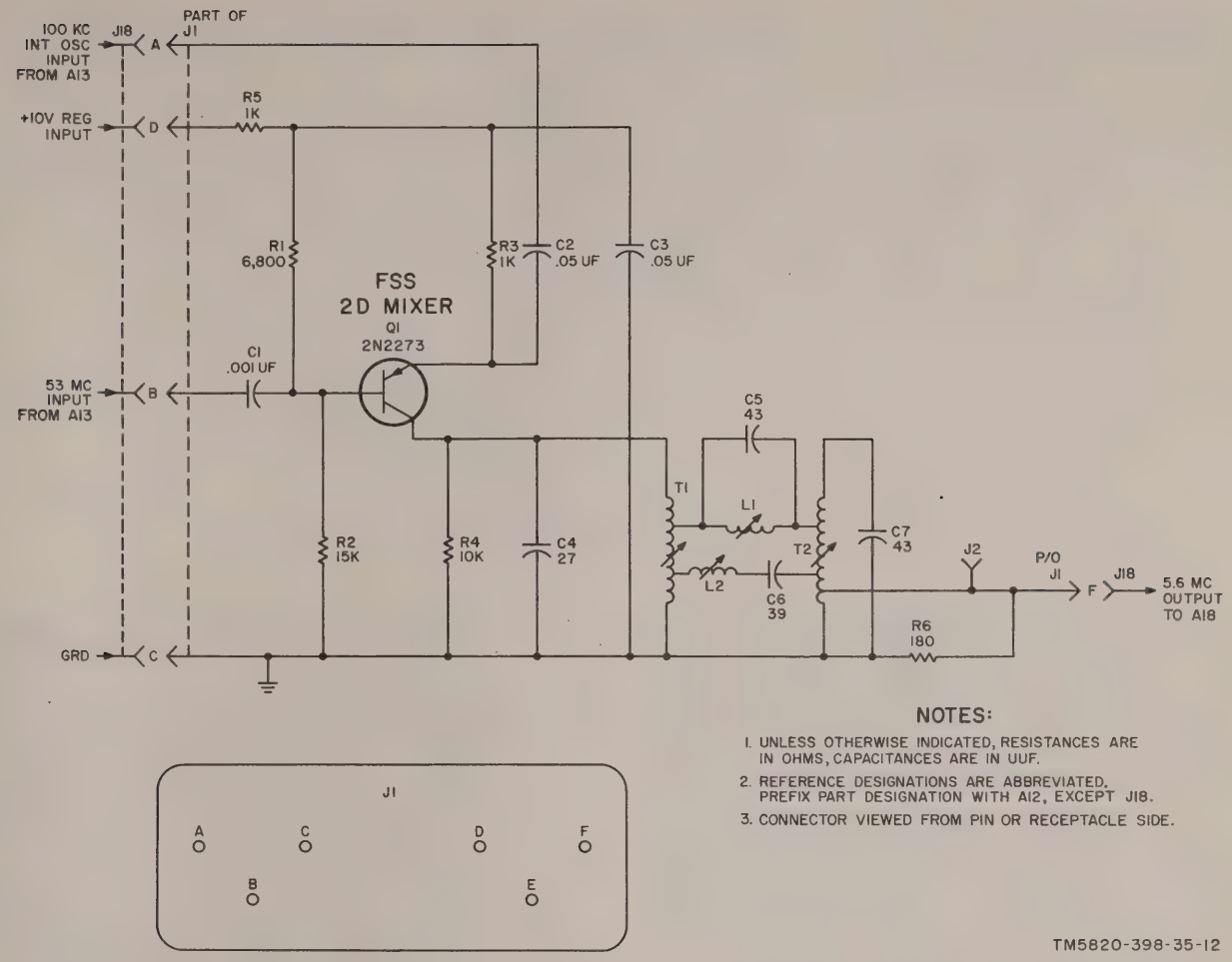


Figure 21. Second mixer module A12, schematic diagram.

output termination and minimizes variations due to discriminator loading. The combination of resistor R9 and capacitor C11 prevents rf leakage into the +10-volt dc supply.

(3) The rf output of module A18 can be measured at test jack J2.

28. Phase Comparator Module A17 (fig. 23)

Phase comparator module A17 contains phase comparator driver Q1 and the phase comparator. The phase comparator compares the phase of the signals from fss if. module A18 (para 27) with those from interval oscillator module A10 (para 24). The input signal from A18 is initially generated by the vfo; the frequency of this signal may be varying. The signal from A10 is generated by a crystal-controlled oscillator; this signal is the reference frequency. The dc output voltage, proportional to the phase difference, is the automatic phase control (apc) voltage applied to vfo module A9 (para 15). If the two signals are in phase, the apc voltage will assume a reference level to maintain the vfo output frequency. If a phase difference is detected, an error voltage is developed in the phase comparator. This change in apc voltage opposes any change in vfo output frequency by returning the vfo output to its correct frequency, and establishes a phase lock.

a. Phase Comparator Driver. The input from fss if. module A18 is coupled through capacitor C1 to the base of phase comparator driver Q1. The amplified signal is coupled to the phase comparator by

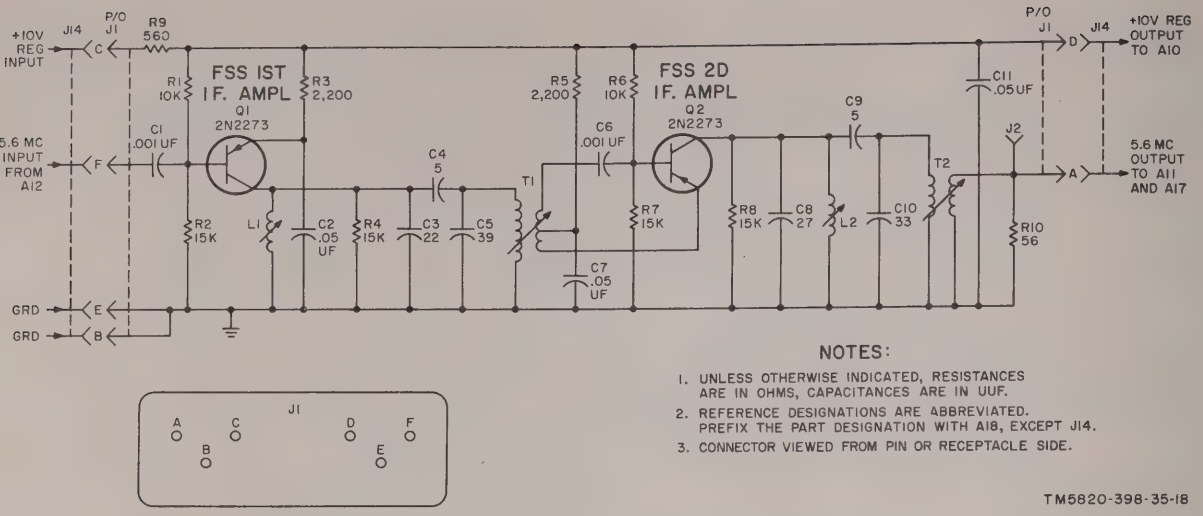


Figure 22. Speech amplifier limiter module A18, schematic diagram.

transformer T1. Resistors R1 and R2 form a voltage divider which provides the fixed-bias portion of the emitter-to-base bias. Emitter resistor R3 establishes the fixed portion of the emitter-to-base bias and stablilizes the emitter current. Capacitor C2 is a bypass capacitor for the Q1 emitter. Capacitors C5 and C6 and inductor L1 form a pi-filter which prevents any rf signals from entering the 10-volt dc supply.

b. Phase Comparator. The phase comparator consists of the tapped secondary winding of T1, coupling capacitors C3 and C4, diodes CR1 and CR2, and resistors R4 and R5. The output voltage of the phase comparator depends on the phase relationship of the two signals applied to the circuit. The voltage output is pivoted about a +3.5-volt dc reference level at the junction of resistors R6 and R7 which is applied to the center tap of transformer T1 and, through the secondary winding of transformer T3 in module A10, to the junction of diodes CR1 and CR2. This voltage is established by the divider action of resistors R6 and R7 which are connected across the 10-volt power supply. Capacitor C7 is an rf bypass capacitor.

(1) The signal induced in the secondary of T1 is coupled through capacitors C3 and C4 to diodes CR1 and CR2, respectively, producing equal and opposite voltages. E1 is applied to CR1, and E2 to CR2. (The E designations are for purposes of reference only.)

(2) The phase comparator also receives an input signal from crystal-controlled interval oscillator module A10 which is injected at the center tap of transformer T1 and the junction of diodes CR1 and CR2. This signal voltage (E3) is exactly 90° out-of-phase with voltages E1 and E2 when the frequency of the 5.6-mc input, developed initially by the vfo, is the same as the crystal-controlled input frequency. This condition exists when the vfo is on frequency. When the two input signals are 90° out-of-phase, the dc output voltage, which is the vectorial sum of voltages E1 plus E3 and E2 plus E3, will be at the +3.5-volt reference level.

(3) Diode CR1 receives a voltage equal to the sum of E1 and E3; diode CR2 receives a voltage equal to the sum of E2 and E3. The diodes rectify the signals, and dc voltages appear across load resistors R4 and R5. When the signal voltages are equal, the output voltages across resistors R4 and R5 are equal, and the total voltage across both resistors, in respect to the junction of resistors R4 and R5, is canceled out,

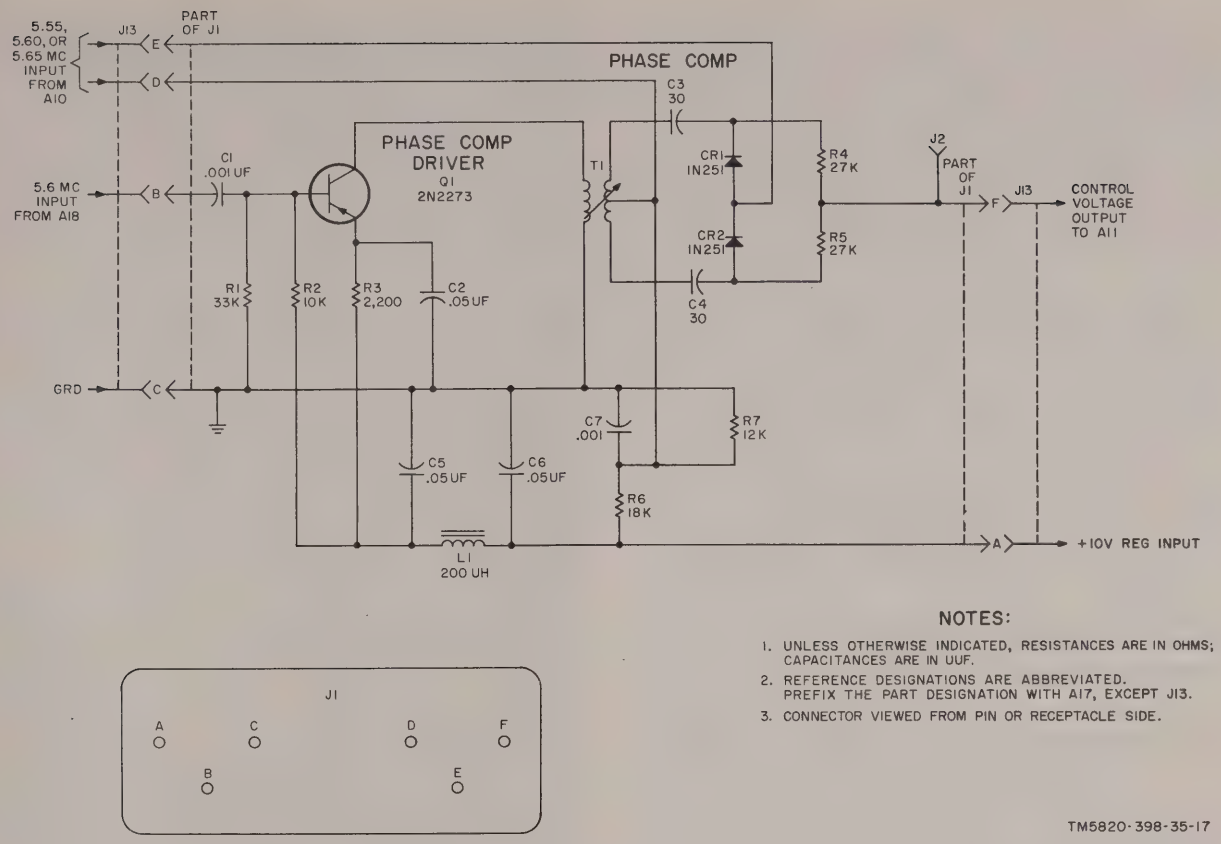


Figure 23. Phase comparator module A17, schematic diagram.

since E1 and E2 voltages are exactly 180° out-of-phase.

(4) If the vfo frequency increases or decreases, changing the 5.6-mc input signal, the 90° vector relationship between the E1 and E2 signal and the E3 signal no longer exists. The change in frequency is equivalent to an E1-E2 phase shift with respect to E3. The resultant vectors of E1 plus E3 and E2 plus E3 are no longer the same length (since the 90° vector relationship of E1-E2 and E3 no longer exists), and the ratio of voltage across the diodes changes. The voltages developed across load resistors R4 and R5 are now unequal, and the dc output will be changed from the +3.5-volt reference level.

(5) The amount the reference level is changed is a function of the phase difference detected in the comparator; the direction of change is a function of vfo frequency shift (increase or decrease). When the frequency increases, the dc output voltage is less than the reference level; when the frequency increases, it is greater than the reference level. The phase comparator output voltage is applied through the antihunt network module A11 to the apc line. The change in apc voltage corrects the vfo output frequency and returns the apc voltage to the reference level when a phase lock is established.

(6) The control voltage output of module A17 can be measured at test jack J2.

29. Frequency Synthesizer System Discriminator Driver Module A11 (fig. 24)

The fss discriminator driver module A11 extends the captive range of the fss. It receives two input signals and develops the

apc voltage in its output circuit. The two input signals are the fss if. signal from the fss if. amplifier module A18 (para 27) and a dc voltage from phase comparator module A17 (para 28). The apc voltage is applied to the capacitance diode circuit of the vfo. If a phase-locked condition exists (that is, if the vfo is on frequency), the apc voltage will assume the reference level to maintain the vfo output on frequency. If the vfo output frequency changes, the fss discriminator will develop ac and dc hunting voltages. These error signals change the apc voltage applied to the frequency control circuit of the vfo, which shifts the vfo output frequency to within the pull-in and hold-in range of the phase comparator.

a. A signal from the fss if. module A18 is applied to the base of discriminator driver Q1 through coupling capacitor C1. The signal is amplified by Q1 and applied to the discriminator (*b* below). Base biasing voltage for Q1 is provided by voltage-divider resistors R1 and R2. Resistor R3 is the emitter swamping resistor for Q1. Resistors R4 and R13 provide series and shunt loading, respectively, for the collector tuned circuit. Capacitor C2 is an rf bypass capacitor for the Q1 emitter.

b. The discriminator is a Travis-type. The tuned circuit, consisting of the transformer T1 secondary and capacitor C3, is tuned to 5.95 mc. The tuned circuit, consisting of transformer T2 secondary and capacitor C4, is tuned to 5.25 mc. At the center frequency of 5.6 mc, both tank circuits have equal currents induced in them. The voltage rectified by diode CR1 and developed across resistor R5, is equal to the voltage rectified by diode CR2 and developed across resistor R6. Since these voltages are equal but of opposite polarity, there is no output. At frequencies above or below the signal center frequency, the voltages developed across resistors R5 and R6 are unequal and a resultant output voltage is developed. Capacitors C5 and C6 rf filter capacitors across load resistors R5 and R6, respectively. The discriminator output can be measured at test jack J2.

c. The discriminator output is pivoted about the control voltage input from A17 at the junction of resistors R8 and R9. The larger portion of the discriminator voltage is developed across resistor R8, and is applied in series with the comparator output to the antihunt network (*d* below) through coupling capacitor C9 as the ac portion of the apc voltage. The remainder of the discriminator voltage is developed across resistor R9; its polarity is opposite to that developed across resistor R8. This voltage, plus the phase comparator output dc voltage, is applied to the antihunt network (*d* below) through discriminator load resistor R10 as the dc portion of the apc voltage. Resistor R7, together with capacitors C7 and C8, determine the reaction time of the discriminator driver.

d. Resistors R11 and R12 together with capacitor C10 form the antihunt network for the fss loop. Both the ac and the dc portions of the apc voltage are applied through this network to the vfo. However, the main effect will occur on the ac portion (developed by the fss discriminator) since the higher the frequency of the error voltage, the higher the attenuation (by virtue of the ac shunting through capacitor C10). To prevent regeneration, this antihunt network damps the fss loop gain and stops the hunting action of the vfo when the phase comparator acquires control of the vfo.

e. Choke L1 and capacitor C11 form a decoupling network to prevent rf from being coupled into the power supply.

30. Voltage Regulator Module A16 (fig. 25)

The voltage regulator circuit supplies the entire fss system, including the vfo, with a regulated +10 volts dc. The regulator uses a high power germanium transistor (Q1) as a series regulator in conjunction with a medium-power silicon transistor (Q2). Transistor Q2 operates as a dc amplifier. The combination of resistor R5 and diode CR2 form a voltage-divider network, with diode CR2 maintaining the base of the dc amplifier at a constant reference voltage. The combination of diode CR1 and emitter resistor R4 forms a voltage divider. Any variation in output voltage appears across resistor R4, since CR1

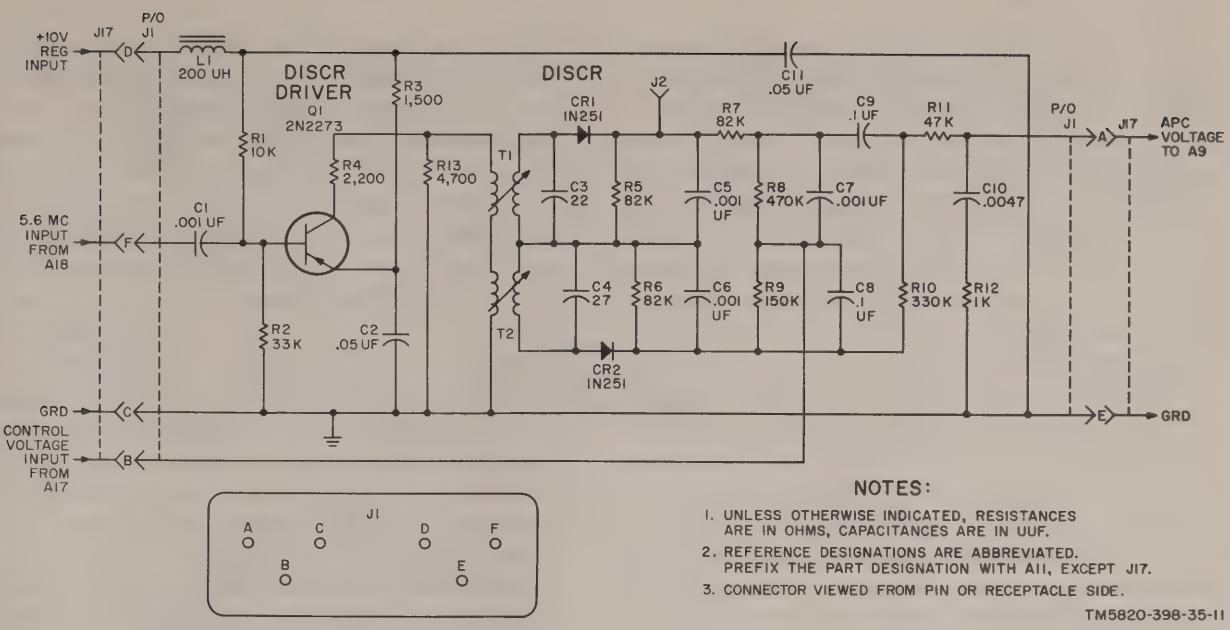


Figure 24. Fss discriminator module A11, schematic diagram.

maintains a constant voltage drop. When the output voltage increases due to a decrease in load or an increase in the input voltage, a proportional positive voltage increase appears at the emitter of dc amplifier Q2 and results in more current flow through Q2. The base of series regulator Q1 goes more positive; conduction through Q1 decreases, which effectively increases the impedance of series regulator Q1. The effect is a decrease in the regulator output; the circuit has compensated for the increase in output voltage. The opposite series of events takes place when the output voltage decreases because of a load increase or input voltage decrease. The regulator provides two +10-volt outputs, one filtered and one unfiltered. The filtered output is filtered by a pi-filter network consisting of coil L1 and capacitors C1 and C2. The filtered output is supplied to modules A14 (para 22) and A15 (para 23). The unfiltered output is supplied to the remainder of the circuits requiring regulated +10 volts. The unregulated input voltage to module A16 can be measured at test jack J2; the regulated output voltage from module A16 can be measured at test jack J3.

31. Dc-to-Dc Converter Module A1 (fig. 26)

The dc-to-dc converter module supplies power amplifier tube V1 with plate voltage during transmission. The dc-to-dc converter uses the 12.5-volt dc battery supply input. Module A1 consists of a transistorized power oscillator, transformer, and rectifier circuit.

a. Transistors Q1 and Q2 are connected in a common collector power oscillator circuit which operates at 4,000 cps. The primary windings, terminals 4 and 6, of transformer T1 provide the load for the transistors. Regenerative feedback to sustain oscillation is applied to the base of each transistor from the winding, between terminals 5 and 7, of transformer T1. The 12.5-volt dc input to module A1 is applied when the function switch is at ON and the handset push-to-talk switch is closed. As a result of circuit unbalance, a larger current flows through one of the transistors and its associated portion of the primary winding of transformer T1 when the supply voltage is initially applied to the oscillator.

(1) Assume that the larger current is flowing through transistor Q1. This

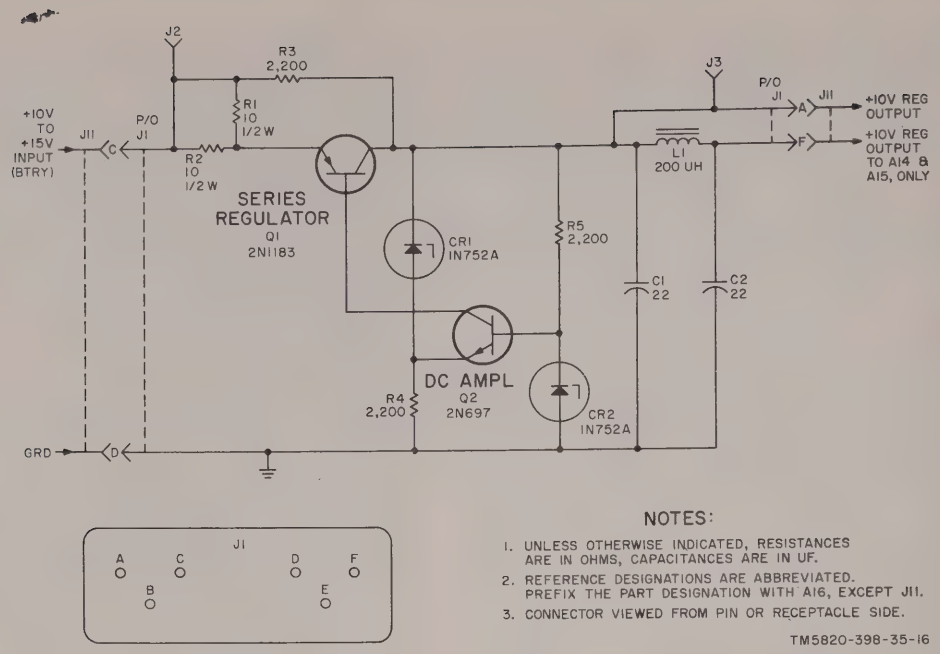


Figure 25. Voltage regulator module A16, schematic diagram.

condition induces a voltage in the feedback winding of transformer T1. The voltage is applied to the bases of the transistors, causing Q1 to conduct even more, and driving Q2 further into cutoff. The flux in the core of transformer T1 changes at a nearly constant rate until the core is saturated. When saturation occurs, no voltage is developed in the feedback windings of transformer T1. The feedback voltage to transistor Q1 decreases rapidly and drives transistor Q1 into cutoff.

(2) When transistor Q1 cuts off, the flux in the core of transformer T1 decreases slightly to induce voltages of opposite polarity across its windings. This reversal of polarity drives transistor Q1 further into cutoff and causes transistor Q2 to conduct. The current through Q2 increases until the transformer core saturates, and the cycle then repeats. During each half cycle, the transformer flux changes from saturation in one direction to saturation in the other. Since transistors Q1 and Q2 switch rapidly from cutoff to saturation, the current in transformer T1 is essentially a square wave.

b. Inductor L1 and capacitors C1 and C2 form a pi-type filter circuit which prevents voltage peaks developed in module A1 from reaching the 12.5-volt supply. A voltage divider, consisting of resistors R1 and R2, establishes the fixed base bias for transistors Q1 and Q2.

c. The rectifier circuit consits of two full-wave rectifiers. The 125-volt output is rectified by diodes CR1 and CR4 and filtered by capacitor C4. The -45-volt output is rectified by diodes CR2 and CR3, and filtered by inductor L2 and capacitor C3. Resistors R4 and R5 are isolating resistors which prevent circuit loading by test equipment probes placed at voltage test jacks J2 and J3. Resistor R3 is a bleeder for the +125-volt output.

32. Test Points

The RT-505/PRC-25 has 28 test points located on 21 modules which enable a maintenance man to locate a faulty module rapidly. These test points are normally

used in conjunction with Test Set, Electronic Plug-in Circuit AN/GRM-55 to isolate a faulty module at the organizational level. If used properly, however, the signal voltages at these test points will expedite maintenance effort at higher echelons. A listing of the modules which are equipped with test points and a description of the signal to be expected at the test point are given below.

a. Module A1. Module A1 has two test points: J2 and J3. Test point J2 permits the -45-volt output of the converter to be checked. Test point J3 permits the +125-volt output of the converter to be checked.

b. Module A3. Module A3 has one test point: J2. Test point J2 permits the rf signal input to A3 (from A2) to be checked. A typical rf signal level at this test point, with a 20-millivolt, 65-mc signal injected at the ANT connector, is 25 millivolts.

c. Module A4. Module A4 has one test point: J2. Test point J2 permits the rf signal input to A4 (from A3 to be checked). A typical rf signal level at this test point, with a 20-millivolt, 65-mc signal injected at the ANT connector, is 80 millivolts.

d. Module A5. Module A5 has one test point: J2. Test point J2 permits sampling the vfo input. A typical rf signal level at this test point, with no signal being received, is 20 millivolts.

e. Module A6. Module A6 has one test point: J2. Test point J2 permits the rf signal input to A6 (from A7) to be checked. A typical rf signal level at this test point, with the RT-505/PRC-25 in transmit condition, is 3 volts.

f. Module A7. Module A7 has one test point: J2. Test point J2 permits the rf signal input to A7 (from A8) to be checked. A typical rf signal level at this test point, with the RT-505/PRC-25 in transmit condition, is 1.5 volts.

g. Module A8. Module A8 has one test point: J2. Test point J2 permits the rf input from the transmitter mixer (in A9) to be checked. A typical rf signal level at this test point, with the RT-505/PRC-25 in transmit condition, is 0.5 volt.

h. Module A9. Module A9 has two test points: J3 and J4. Test point J3 permits the input apc voltage (from A11) to be checked. A typical apc voltage level, with the vfo properly aligned, is +3.8 volts dc. Test point J4 permits the output of vfo Q1 (in A9) to be checked. A typical rf signal level of the vfo is 0.3 volt.

i. Module A10. Module A10 has two test points: J2 and J3. Test point J2 permits

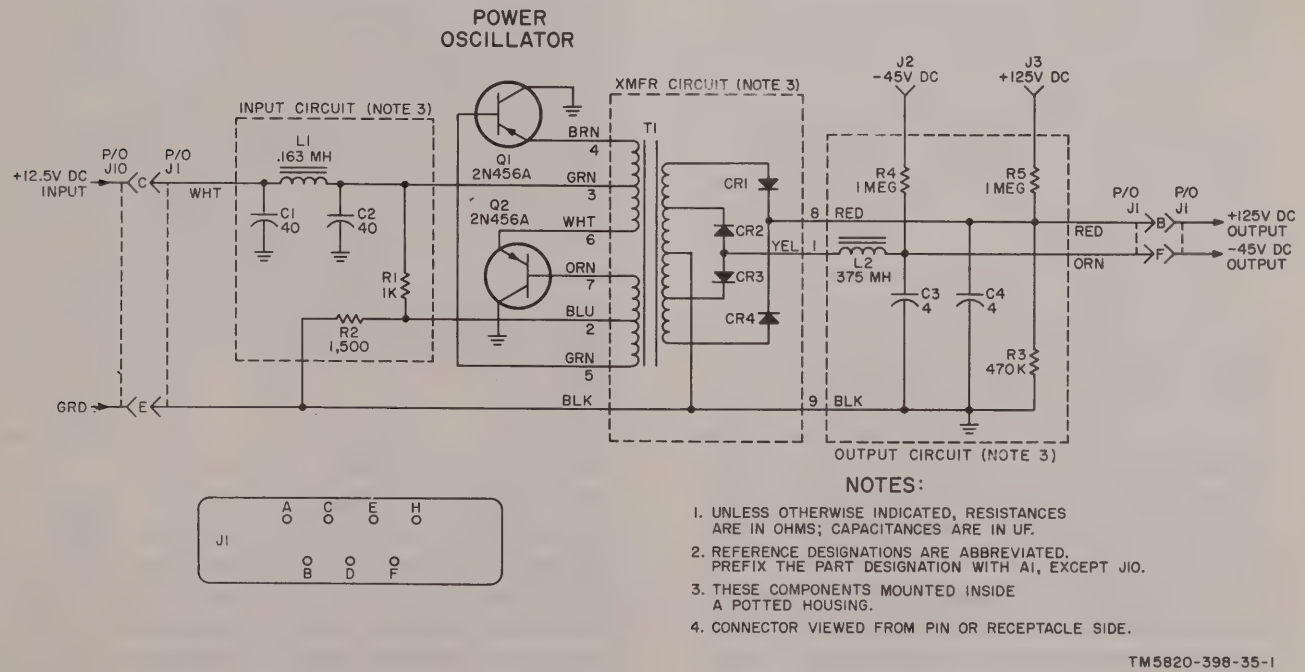


Figure 26. Dc-to-dc converter module A1, schematic diagram.

the output of oscillator Q1 (in A10) to be checked. A typical rf signal level at this test point is 0.2 volt. Test point J3 permits the output of oscillator Q2 (in A10) to be checked. A typical rf signal level at this test point is 1.8 volts.

j. Module A11. Module A11 has one test point: J2. Test point J2 permits the output of the discriminator (in A11) to be checked. A typical discriminator output level, with the fss if. input disabled (by pressing S2 on the main frame), is a 1.5-volt peak-to-peak, 10-cps signal.

k. Module A12. Module A12 has one test point: J2. Test point J2 permits the fss if. output of A12 to be checked. A typical rf signal level at this test point is 80 millivolts.

l. Module A14. Module A14 has two test points: J2 and J3. Test point J2 permits sampling the vfo input (from A9). A typical rf signal level at this test point is 0.2 volt. Test point J3 permits sampling the spectrum generator input (from A15). A typical rf signal level at this test point is a 1.5-volt peak-to-peak, 1-mc pulse.

m. Module A16. Module A16 has two test points: J2 and J3. Test point J2 permits the unregulated voltage input (12 volts dc) from the battery to be checked. Test jack J3 permits the regulated voltage output (10 volts dc) to be checked.

n. Module A17. Module A17 has one test point: J2. Test point J2 permits the control voltage output of A11 to be checked. A typical control voltage level, with the reference frequency input from A10 disabled (by pressing S3 on the main frame), is +3.6 volts dc.

o. Module A18. Module A18 has one test point: J2. Test point J2 permits the fss if. output of A18 to be checked. A typical rf signal level at this test point is 0.3 volt.

p. Module A20. Module A20 has one test point: J2. Test point J2 permits the output of the sidestep oscillator to be checked. A typical rf signal level at this test point, with the RF-505/PRC-25 in transmit condition, is 0.7 volt.

q. Module A21. Module A21 has two test points: J3 and J4. Test point J3 permits the rf input to A31 (from the 11.5-mc crystal filter) to be checked. A typical rf signal level at this test point, with a 20-millivolt, 65-mc signal injected at the ANT connector, is 40 millivolts. Test point J4 permits the amplified output of A21 to be checked. A typical signal level at this test point, with the same input as above, is 600 millivolts.

r. Module A22. Module A22 has one test point: J3. Test point J3 permits the amplified output of the speech amplifier limiter to be checked. A typical audio signal level at this test point, with a 4-millivolt input to A22 (RT-505/PRC-25 in transmit condition), is 1.8 volts.

s. Module A23. Module A23 has one test point: J3. Test point J3 permits the 150-cps output of the tone generator to be checked. A typical audio signal level at this test point, with the RT-505/PRC-25 in transmit condition, is 0.9 volt.

t. Module A24. Module A24 has one test point: J3. Test point J3 permits the 150-cycle squelch tone signal, amplified in the frequency-selective circuits of the tone squelch, to be checked. A typical audio signal level at this test point, with an rf signal having a 150-cps modulation detected by the receiver, or with the RT-505/PRC-25 in transmit condition, is 1 volt.

u. Module A25. Module A25 has two test points: J3 and J4. Test point J3 permits the amplitude of the demodulated signal to be checked. A typical audio signal level at this test point, with a 20-millivolt, 65-mc signal injected at the ANT connector, is 180 millivolts. Test point J4 permits the amplified audio output of A25 to be checked. A typical audio signal level at this test point, with the above signal injected at the ANT connector and with the VOLUME control fully clockwise, is 4.5 volts.

33. Power Distribution

a. General. The primary power source for Radio Set AN/PRC-25 can be either a Battery, Dry BA-386/PRC-25 or an Amplifier-Power Supply Group OA-3633/GRC is used when the AN/PRC-25 is operated in a vehicle. The power distribution described in *b* and *c* below is for use with

the 0A-3633/GRC. The power distribution when a BA-386/PRC-25 is used is similar except that a shorting cap is installed on J3 and the BA-386/PRC-25 is connected to J4 (fig. 88).

b. Receive (fig. 86). When function switch S1 is at ON, and the handset push-to-talk button is not depressed, the RT-505/PRC-25 will receive. The input voltage from the primary power source is applied through connector J3.

(1) The input voltage from connector J3E (+12.5 volts) is connected to contact 2 of S1 (rear). The +12.5 volts is applied through contacts of switch S1 (rear) and connector A16J1C to the input of module A16. Regulated +10 volts from module A16 is applied through connector A16J1F and the individual module connectors to modules A14 and A15 through A16J1A to modules A9, A10, A11, A17, A18, and A25. Test switches S2 and S3 are in series with the voltages supplied to module A10. Regulated +10 volts is supplied from module A18 through contacts C of J14 and D of J18 to module A12. Regulated +10 volts is also applied from J11A through filter L2 (in A30), contacts 4 and 6 of transmit-receive relay K1, and choke L4 to module A5; from contact 6 of K1 to module A21, and from contact 6 of K1 through choke L3 to module A3. Relay K1 opens these circuits during transmission. When function switch S1 is at SQUELCH, regulated +10 volts is applied from J11A through contacts 4 and 3 of S1 (front) to module A24. This circuit is opened when switch S1 is at positions other than SQUELCH.

(2) When at SQUELCH, a ground is connected through contacts 8 and 10 of switch S1 (front) and through contacts 8 and 2 of deenergized relay K3 to terminal 9 of mother board A27. This condition grounds the output of module A25, which prevents audio signals from being applied to the handset. When K3 is energized, the ground is removed from contact 2 of K3 and applied to contact 3 of K3 to allow the audio output of module A25 to be applied to the handset. Relay K3 is energized by the squelch relay driver stage (Q5) in module A24.

c. Transmit (fig. 87). When function switch S1 is at ON and the handset push-to-talk switch is pressed, the transmitter circuits are activated. When the push-to-talk button is pressed, the control circuits of relays K1 and K2 are completed.

(1) The input voltage from connector J3E (+12.5 volts) is applied, through contacts 8 and 3 of relay K2, to dc-to-dc converter module A1. Module A1 has two dc output voltages, +125 and -45, which are used only for transmission. The +125-volt output (from A1J1B) is applied to the plate circuit of the transmitter power amplifier through terminal 2 of assembly A29. The -45-volt bias (from A1J1F) is applied directly to the control grid circuit of assembly A29 and to module A6; it is also applied to module A7 through choke L1.

(2) Filament voltage for transmitter power amplifier V1 is applied from the input connector J3-H through contacts 4 and 7 of relay K2 to terminal 4 of assembly A29.

(3) The input voltage to A16 is applied from connector J3-E through function switch S1 to input connector A16J1-C. The regulated +10-volt output of A16 is coupled from J11A through inductor L2 (in A30) to contact 4 of relay K1. With relay K1 energized (on transmit), the regulated +10 volts is transferred to contact 7 of K1 and is applied through inductor L4 to modules A8, A10, A20, A22, and A23. The regulated +10 volts is applied from module A16 through J11A direct to modules A9, A10, A17, and A18 and from J11F to modules A14 and A15 when both on transmission and reception.

CHAPTER 3

THIRD ECHELON MAINTENANCE

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

Warning: Be extremely careful when servicing the RT-505/PRC-25. During operation, 125 volts dc exists at the plate circuit of the power amplifier.

34. Scope of Third Echelon Maintenance

Third echelon maintenance procedures (para 35 through 45) supplement the maintenance procedures described in TM 11-5820-398-10 and TM 11-5820-398-20. Third echelon maintenance includes systematic troubleshooting procedures (para 35 through 39), repair procedures (para 40 through 42), and instructions for aligning power amplifier tank module A2, variable frequency oscillator module A9, and sidestep oscillator module A20 (para 43 through 45).

35. Organization of Third Echelon Troubleshooting Procedures

a. General. The first step in troubleshooting a defective RT-505/PRC-25 is to sectionalize the fault to a major area such as the power supply, function switch circuits, or case wiring. The second step is to localize the fault to a defective assembly or area. The third step is to isolate the faulty part or circuit board within an assembly.

b. Sectionalization. The following group of tests is arranged to reduce unnecessary work and to aid in troubleshooting a defective RT-505/PRC-25. Sectionalize the trouble to faulty units by following the procedures listed in (1) and (2) below:

(1) *Visual inspection.* Visual inspection may locate faults without testing or measuring the circuits.

(2) *Operational tests.* Operational tests frequently indicate the general location of a trouble. In many instances, operational tests, such as the equipment performance checklist (TM 11-5820-398-20), will help in determining the exact nature of the fault.

c. Localization and Isolation. The procedures given in (1) through (3) below will aid in localizing and isolating the trouble. Localize the trouble to an area, and then isolate the trouble to a defective part. Use the following methods:

(1) *Troubleshooting chart.* The trouble symptoms listed in the troubleshooting chart (para 38) will aid in localizing and isolating trouble to a part or to an assembly.

(2) *Voltage and resistance measurements.* Most troubles must be located by voltage and resistance measurements. The RT-505/PRC-25 is transistorized. Observe the following precautions to prevent transistor damage. Make voltage and resistance measurements *only as specified.* When measuring voltages, use tape or sleeving to insulate the entire test probe, except the extreme tip. A momentary short circuit can ruin a transistor. (For example, if the bias is shorted out, excessive current between the emitter and the base may ruin the transistor.)

(3) *Intermittent troubles.* The possibility of intermittent troubles should not be overlooked. If present, this type of trouble may often be made to appear by tapping or jarring the RT-505/PRC-25. Check the wiring, the connections, and the plugs and jacks of the various modules.

36. Test Equipment and Additional Equipment Required

The following charts list the equipment required for troubleshooting the RT-505/

PRC-25. The charts also list the associated technical manuals for the equipment.

a. Test Equipment.

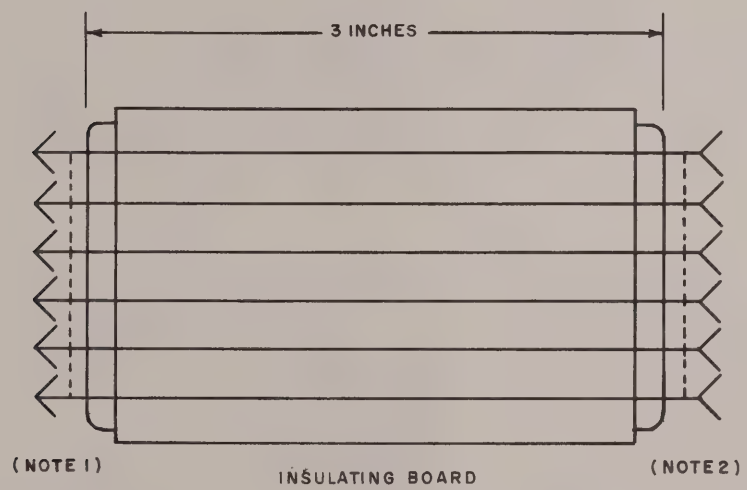
Test equipment	Technical manual
Multimeter ME-26B/U	TM 11-6625-200-12
RF Wattmeter AN/URM-43A[a].	TM 11-5133
Signal Generator AN/URM-48[a].	TM 11-1257
Frequency Meter AN/USM-26.	TM 11-5057
RF Millivoltmeter 411A	

[a]If specific models are not available, other models of the same nomenclature having similar characteristics may be used.

b. Additional Equipment Required.

Equipment	Technical manual
Antenna AT-892/PRC-25	TM 11-5820-398-10
Handset H-138/U	TM 11-5820-398-10
Battery, Dry BA-386/PRC-25.	TM 11-5820-398-10
Module extender[a]	(fig. 27)
Alignment cover for module A20[a].	(fig. 28)
Dummy antenna, consisting of:[a]	(fig. 41)
Connector, UG-447/U (two required).	
Resistor, fixed, 510 ohms, 1 watt.	
Resistor, fixed, 56 ohms, 1 watt (two required).	
Wire, stranded, AWG No. 18.	
Aluminum can 6 in. x 2.5 in. x 2.5 in.	
Cord CG-530/U, p/o Frequency Meter AN/USM-26.	TM 11-5057

[a]Must be fabricated by maintenance personnel (fig. 27, 28, and 41).

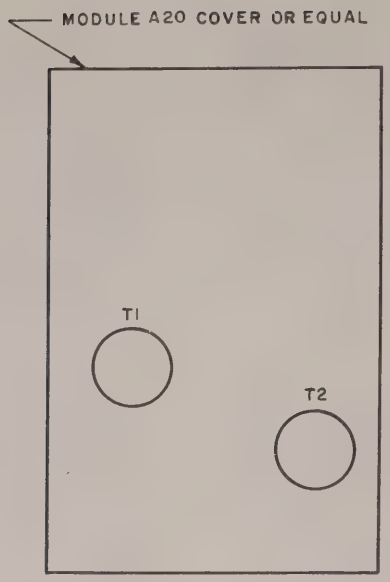


NOTES:

1. USE CONNECTOR SIMILAR TO THAT ON MODULE A20
2. USE CONNECTOR SIMILAR TO J16 IN RECEIVER-TRANSMITTER RT-505/PRC-25
3. FOR INTERCONNECTIONS, USE NO. 18 AWG STRANDED WIRE
4. MOUNT CONNECTORS ON INSULATING BOARD

TM5820-398-35-50

Figure 27. Typical module extender for module A20.



TM5820-398-35-51

Figure 28. Typical alignment cover for module A20.

Section II. THIRD ECHELON TROUBLESHOOTING

Caution: Do not attempt removal or replacement of parts before reading the instructions in paragraph 40.

37. Test Setup

a. Preparatory Steps. Prepare the RT-505/PRC-25 for bench testing as follows:

(1) Remove Battery Box CY-2562/PRC-25 and Battery, Dry BA-386/PRC-25 (TM11-5820-398-10 (para 28)).

(2) Remove the receiver-transmitter case (TM 11-5820-398-20 (para 8)).

(3) Be sure the POWER receptacle cover is on the POWER receptacle. The POWER receptacle cover contains jumpers necessary for battery operation.

(4) Connect the BA-386/PRC-25 to the battery plug on the RT-505/PRC-25.

b. Test Equipment.

(1) *Receiver section.*

(a) Use the AN/URM-48 to provide a test signal. Set the controls on the AN/URM-48 as follows:

Control	Position or indication
BAND SWITCH[a] -------	C or D
RF TUNING control[a] ---	45.00 or 64.00
DEVIATION RANGE switch.	25
OPERATION switch ----	1000∞
DEVIATION LEVEL control.	Adjust for 10 kc on KILOCYCLES DEVIATION meter.
RF SET TO LINE control.	Adjust for MICROVOLTS meter indication at RF SET TO LINE.
RF ATTENUATOR MICROVOLTS control.	Adjust for 0.70 microvolt on right-hand meter.

[a] The setting of the BAND SWITCH and the RF TUNING control will be determined by the RT-505/PRC-25 operating frequency.

(b) Connect the AN/URM-48 RF cable to one end of the dummy antenna.

(c) Connect the other end of the dummy antenna to the receiver-transmitter ANT connector; use cord CG-530/U.

(d) Connect Handset H-138/U to one of the receiver-transmitter AUDIO connectors.

(e) Set the receiver-transmitter controls as follows:

Control	Position or indication
Function switch	OFF
BAND switch	30-53
Tuning controls	45.00
VOLUME control	5

(f) Use Multimeter ME-26B/U to make the voltage and resistance checks directed in the troubleshooting chart (para 38).

(2) *Transmitter section.*

(a) Use RF Wattmeter AN/URM-43A to provide antenna loading for the transmitter. Set the 15W-60W switch on the AN/URM-43A at 15W.

(b) Connect the AN/URM-43A to the receiver-transmitter ANT connector.

(c) Connect Handset H-138/U to one of the receiver-transmitter AUDIO connectors.

(d) Set the receiver-transmitter controls as follows:

Control	Position or indication
Function switch	OFF
BAND switch	30-53
Tuning controls	45.00
VOLUME control	5

38. Localizing and Isolating Troubles

a. Test Conditions. Perform all checks outlined in the troubleshooting chart with the equipment under test connected to the BA-386/PRC-25 and to the additional equipment as specified in paragraph 37. *Disconnect the BA-386/PRC-25 when making resistance checks.*

b. Test Procedure. Turn the test equipment on and allow for a 5-minute warmup. Set the function switch of the RT-505/PRC-25 at ON.

Note: For removal and replacement of modules, refer to TM 11-5820-398-20, paragraph 10.

c. Troubleshooting Charts.

(1) *Troubleshooting chart for receiver section of RT-505/PRC-25.*

Item	Indication	Probable trouble	Procedure
1	REC-TRANS FREQUENCY channel dial lamp does not light when the function switch is at LITE.	a. Connector J3 or J4 defective	a. Check J3 and J4 (fig. 31 and 32) for bent, broken, or missing pins.
		b. Switch S2 defective	b. Check wiring between switch S1, terminal 7, and XDS1 (fig. 29 and 88). Check wiring between terminals 6 and 5 of S1. Check continuity from S1, terminal 8, to ground (fig. 88).
2	No 1,000-cps output signal from the AN/URM-48 is heard in the H-138/U when the function switch is at ON.	a. Open circuit between A16 and A27.	a. Check physical condition of J11. Check printed wiring of A27 (fig. 34 and 88) by visual inspection and continuity measurements. Check continuity between pin A of J11 and pin 11 of A27, and between pin D of J11 and pin 4 of A27 (fig. 88).
		b. Open circuit between A16 and J4.	b. Check continuity between pin C of J11 and pin B of J4 (fig. 88).
		c. Open circuit between A25J2 and A27.	c. Check continuity between pins 1, 2, and 3 of A25J2 and pins 11, 10, and 9, respectively, of A27 terminal strip (fig. 88).
		d. Open circuit between A27 and FL1 or FL2.	d. Check continuity between pins 9 and 10 of A27 terminal strip, and pins B and A, respectively, of FL1 and FL2 (fig. 88).

Item	Indication	Probable trouble	Procedure
		e. Defective relay K3 or relay socket XK3.	e. Check continuity between terminals 2 and 8 of relay K3 (normal indication is 0 ohm). Check continuity between terminals 3 and 8 of relay K3 (normal indication is infinity). Check physical condition of XK3 (fig. 33 and 88).
		f. Defective wiring between XK3 and A27.	f. Check continuity between pin 2 of XK3 and pin 9 of A27 terminal strip (fig. 32 and 88).
		g. Defective capacitor A27C10 or A27C11.	g. Check resistance of A27C10 and A27C11 (fig. 88). (Should indicate several megohms.)
3	Received signals are not heard, but a rushing noise is heard in the H-138/U when the function switch is at ON and the long antenna is installed at ANT connector J1. Received signals are normal with the short antenna installed.	a. Defective A28S2 or A28S3 -----	a. Check physical condition of A28S2 and A28S3. Check continuity through A28S2 and A28S3, with long antenna installed (fig. 16 and 31).
		b. Defective A28S1 or A28L4 ----	b. Change bands and retest. If signal is received on the high band but not on the low, turn S1 to the low-band position and check continuity between pins 1 and 2 of A28 (fig. 34 and 88). If resistance is infinity, check continuity of A28L4 and between pins 8 and 9 of A28S1. Check continuity between J1 and pin 1 of A28 (fig. 88). If resistance is high, check continuity between terminals 5 and 6 of A28S1. Check C2A, on main frame (fig. 34 and 88).
		c. Defective A28S1, A28L1, or A28C2.	c. If signal is received on a low band but not on the high, turn S1 to high-band position and check continuity between A28S1, terminal 10 and A28, terminal 1. Check A28L1 and A28C2 (fig. 16).
4	Received signals are not heard, but a rushing noise is heard in the H-138/U when the function switch is at ON and the short antenna is installed at ANT connector J1. Received signals are normal with the long antenna installed.	a. Defective A28S1 or A28L3 ----	a. Change bands and retest. If signal is received on high band but not on low, turn S1 to the low-band position and check continuity between J1 and A28S1, terminal 11. Check A28L3 and A28C3 (fig. 16).
		b. Defective A28S1 or A28L2 ----	b. If signal is received on the low band but not on the high, turn S1 to the high-band position and check continuity between J1 and A28S1, terminal 1 (fig. 88). Check A28L2 (fig. 16).
		c. Defective A28C1 ----------	c. If signal is not received on either band (with short antenna) but is normal with long antenna, check A28C1 (fig. 16).
5	When signals from the AN/URM-48 are applied, one band operates properly but on the other band, a rushing noise is heard in the H-138/U when the function switch is at ON.	Defective BAND switch shaft -----	Higher echelon maintenance required.
6	When signals from the AN/URM-48 are applied, a rushing noise is heard in the H-138/U on	a. Defective relay K1 ----------	a. Check continuity between terminals 4 and 6 of K1 (normal indication is 0 ohm). Check

Item	Indication	Probable trouble	Procedure
	either band when the function switch is at ON. Transmit operation is normal.		continuity between contacts 3 and 8 of K1 (fig. 88). (Normal indication is infinity.)
		b. Defective A30L2 ----------	*b.* Check continuity between terminals 2 and 7 of A30L2 (fig. 88).
		c. Defective wiring in the regulated +10-volt line to A3, A4, A5, or A21.	*c.* Connect the common lead of the ME-26B/U to pin A of J11 and successively check continuity to the following points: pin 1 of A27; pins 1 and 3 of J7; and pin G of J9. If the indication obtained at pin 3 of J7 is infinity, check L3. If the indication obtained at pin G of J9 is infinity, check L4. Check the physical condition of J1 and J9 (fig. 88).
		d. Defective wiring between A2 and A3.	*d.* Check continuity between pin 9 of J8 and pin 8 of J8. Check physical condition of J8 (fig. 31 and 88).
		e. Defective wiring between A3 and A4.	*e.* Check continuity between pin 5 and pin 4 of J8, and pin 6 and 3 of J8 (fig. 31 and 88).
		f. Defective wiring between A4 and A5.	*f.* Check continuity between pin 1 of J8 and pin B of J9; and between pin 2 of J8 and pin A of J9 (fig. 31 and 88).
		g. Defective wiring between A9 and A5.	*g.* Check continuity between pin 4 of J5 and pin H of J9 (fig. 31 and 88). If the indication is infinity, check R1. Recheck wiring.
		h. Defective wiring between A5 and 11.5-mc filter FL3.	*h.* Check continuity between pin C of J9 and IN terminal of FL3 (fig. 31, 32, and 88).
		i. Defective 11.5-mc filter FL3--	*i.* Examine external filter wiring for breaks or other signs of deterioration. Check FL3 by substitution (fig. 32 and 88).
		j. Defective wiring between FL3 and A21.	*j.* Check continuity between OUT terminal of FL3 and pin 2 of connector A21J1 (fig. 33 and 88).
		k. Defective wiring between A21 and 11.5-mc discriminator Z1.	*k.* Check continuity between pin 3 of A21J2 and IN terminal of Z1 (fig. 33 and 88).
		l. Defective 11.5-mc discriminator Z1.	*l.* Examine external filter wiring for breaks or other signs of deterioration. Check Z1 by substitution (fig. 33 and 88).
		m. Defective wiring between Z1 and A25.	*m.* Check continuity between OUT terminal of Z1 and pin 1 of A25J1 (fig. 33 and 88).
		n. Defective wiring between A25 and R1 (VOLUME control).	*n.* Check continuity between center tap of R1 and pin 3 of A25J1. Check continuity between pin 4 of A27 and pin 4 of A25J1 (fig. 33 and 88).
7	A rushing noise is heard in the H-138/U when the function switch is at ON, when either antenna is used on either band. The transmitter is also inoperative.	*a.* Defective regulated +10-volt wiring to A9.	*a.* Check continuity between pin A of J11 and pin 2 of J5 (fig. 31 and 88).
		b. Defective C1 or C2 ----------	*b.* Check physical condition of C1 and C2. Higher echelon repair required (fig. 34 and 88).
8	When a signal is not being received, a rushing noise is heard	*a.* Defective relay K3 ----------	*a.* Check continuity between contacts 8 and 3 of relay K3 (fig.

Item	Indication	Probable trouble	Procedure
	in the H-138/U with the function switch at SQUELCH.		32 and 88). (Normal indication is infinity, with no signal input.)
		b. Defective A24J2 ----------	*b.* Check physical condition of A24J2. Remove relay K3 from XK3 and check continuity between pin 3 of A24J2 (fig. 33 and 88) and ground. (Normal indication is infinity.)
9	No output is heard in the H-138/U when the function switch is at SQUELCH in either the receive or transmit mode of operation.	*a.* Defective S1 ----------	*a.* Check continuity between pins 8 and 10 of S1 and between pins 3 and 4 of S1 (fig. 88).
		b. Defective wiring between S1 and K3.	*b.* Check continuity between pin 10 of S1 and pin 8 of XK3. Check continuity between pin 4 of S1 and pin 1 of XK3 (fig. 33 and 88).
		c. Defective wiring between S1 and A24.	*c.* Check continuity between pin 4 of S1 and pin 1 of A24J2 (fig. 33 and 88).
		d. Defective wiring between A24 and K3.	*d.* Check continuity between pin 3 of A24J2 and pin 5 of relay socket XK3 (fig. 33 and 88).
		e. Defective relay K3 ----------	*e.* Check relay K3 by substitution.
10	No output is heard in the H-138/U when the function switch is at SQUELCH with a proper (150-cps modulated) signal being received.	Defective wiring between A25 and A24.	Check continuity between pin 4 of A25J1 and pin 1 of A24J1 (fig. 33 and 88).
11	No output is heard in the H-138/U during transmit operation when the function switch is at SQUELCH. Output is normal during receive operation.	*a.* Defective wiring between A23 and A24.	*a.* Check continuity between pin 1 of A23J1 and pin 4 of A24J1 (fig. 33 and 88).
		b. Defective wiring between A27 and A23.	*b.* Check continuity between pin 14 of A27 and pin 2 of A23J2 (fig. 33 and 88).
12	Receives and transmits signal on the wrong channel.	*a.* Defective regulated +10-volt wiring to fss modules.	*a.* Check continuity between the following points: (1) Pin A of J11 and pin D of J17. (2) Pin A of J11 and pin A of J13. (3) Pin A of J11 and pin C of J14. (4) Pin A of J11 and pin 2 of J5. (5) Pin A of J11 and pin G of J12. (6) Pin A of J11 and pin 11 of J12. (7) Pin F of J11 and pin B of J20. (8) Pin F of J11 and pin A of J21. (9) Pin D of J14 and pin D of J18 (fig. 31 and 88). If the measurement between pin A of J11 and pin G or H of J12 is infinity, check S2 and S3.
		b. Defective wiring between A9 and A14.	*b.* Check continuity between pin 1 of J6 and pin A of J20 (fig. 31 and 88). Check printed wiring of A26 (fig. 34). Check physical condition of J6 and J20.
		c. Defective wiring between A14 and A13.	*c.* Check continuity between pin E of J20 and pin F of J19, and between pin D of J20 and pin

Item	Indication	Probable trouble	Procedure
			E of J19. Check physical condition of J19 (fig. 31 and 88).
		d. Defective wiring between A15 and A14.	*d.* Check continuity between pin E of J21 and pin F of J20. Check physical condition of J21 (fig. 31 and 88).
		e. Defective wiring between A13 and A10.	*e.* Check continuity between pin J of J12 and pin D of J19. Check physical condition of J12 (fig. 31 and 88).
		f. Defective wiring between A13 and A12.	*f.* Check continuity between pin B of J19 and pin B of J18, and between pin A of J19 and pin A of J18. Check physical condition of J18 (fig. 31 and 88).
		g. Defective wiring between A12 and A18.	*g.* Check continuity between pin F of J18 and pin F of J14. Check physical condition of J14 (fig. 31 and 88).
		h. Defective wiring between A18 and A11.	*h.* Check continuity between pin A of J14 and pin F of J17. Check physical condition of J17 (fig. 31 and 88).
		i. Defective wiring between A18 and A17.	*i.* Check continuity between pin A of J14 and pin B of J13. Check physical condition of J13 (fig. 31 and 88).
		j. Defective wiring between A10 and A17.	*j.* Check continuity between pin B of J12 and pin E of J13, and between pin A of J12 and pin D of J13 (fig. 31 and 88).
		k. Defective wiring between A17 and A11.	*k.* Check continuity between pin F of J13 and pin B of J17 (fig. 31 and 88).
		l. Defective wiring between A11 and A9.	*l.* Check continuity between pin A of J17 and pin 2 of J6 (fig. 31 and 88).
		m. Capacitor C8 defective--------	*m.* Check leakage resistance of C8 with A9 and A11 removed. (Leakage resistance should be several megohms.)
13	Receives signal on the wrong channel. Transmit operation is normal.	Defective wiring to diode switching network in A10.	Check continuity between pin M of J3 and pin C of J12. Check continuity between pin 7 of A30 and pin E of J12 (fig. 31 and 88).
14	High-frequency noise in the audio output.	FL1 or FL2 defective ----------	Replace FL1 or FL2 (fig. 34).
15	Tuning knobs do not function properly.	Selector mechanism defective ----	Higher echelon repair required.

(2) *Troubleshooting chart for transmitter section of RT-505/PRC-25.*

Item	Indication	Probable trouble	Procedure
1	Low rf power output indicated on the AN/URM-43A.	*a.* Low dc voltage applied to A29V1.	*a.* Check dc voltage input to A29 (para 39).
		b. Improper antenna loading -----	*b.* Perform the procedures in item 3 or 4 of (1) above, as applicable.
		c. Improper alignment of C1-----	*c.* Higher echelon maintenance required.
2	No rf power output indicated on the AN/URM-43A on one band. Receiver also defective on the same band.	Defective BAND switch shaft-----	Higher echelon maintenance required.

Item	Indication	Probable trouble	Procedure
3	No rf power output indicated on the AN/URM-43A on one band. Receiver operation is normal on both bands.	*a.* Defective C1 ----------	*a.* Higher echelon maintenance required.
		b. Defective S4, or wiring from S4 to A26 assembly.	*b.* Check S4 and continuity of wiring between S4 and A26. Check printed wiring of A26 (fig. 34 and 88).
		c. Defective wiring between A19 and A20.	*c.* Check continuity between pin D of J15 and pin B of J16 (for low band), and between pin F of J15 and pin B of J16 (for high band). Check physical condition of J15 and J16 (fig. 31 and 88).
4	No rf power output indicated on the AN/URM-43A on either band. Receive operation is normal.	*a.* Defective FL1 or FL2 --------	*a.* Connect the handset to AUDIO connector FL1, press the H-138/U push-to-talk switch. Repeat the procedure with the H-138/U connected to FL2. If the transmitter operates properly from one AUDIO connector, but not the other, replace the defective connector (para 47).
		b. Defective A30L2 ----------	*b.* Check continuity between pins 2 and 7 of A30. Replace A30L2 if indication is infinity (fig. 88).
		c. Defective relay K1 ----------	*c.* Key the transmitter and check the voltage between contacts 4 and 7 of K1. Zero volt should be obtained, indicating closed (energized) contacts.
		d. Defective indicator A30L4 ----	*d.* Check continuity between pins 4 and 9 of A30. Replace A30L4 if indication is infinity (fig. 88).
		e. Defective capacitor A30C1 ----	*e.* Check A30C1 by substitution (fig. 88).
		f. Defective relay K2 ----------	*f.* With handset keyed, check voltage across contacts 8 and 3 and across contacts 4 and 7 of K2. In each case, 0 volt should be measured, indicating closed (energized) relay contacts.
		g. Defective +12.5-volt distribution wiring.	*g.* Check continuity between contact 3 of K2 and pin C (fig. 34 and 88) of J10. Check physical condition of J10 (fig. 31 and 88).
		h. Defective +2.5-volt distribution wiring.	*h.* Check continuity between contact 7 of K2 and pin 4 (fig. 34) of A29 (fig. 88).
		i. Defective -45-volt distribution wiring.	*i.* Check continuity between pin F of J10 and the following points: (1) Pin 7 of A29. (2) Pin 15 of J6. (3) Pin 8 of J5. Replace L1 if the measurements between pin F of J10 and pin 8 of J5 indicate infinity. Check physical condition of J5 and J6 (fig. 31 and 88).
		j. Defective +125-volt distribution wiring.	*j.* Check continuity between pin B of J10 (fig. 31) and pin 2 of A29 (fig. 88).
		k. Defective +10-volt regulated distribution wiring.	*k.* Check continuity between pin 9 of A30 and pins 5 and 6 of J5, and pin C of J16. Replace L2 if measurement between pin 9 of A30 and pin 6 of J5 in-

Item	Indication	Probable trouble	Procedure
			dicates infinity. Check physical condition of J16 (fig. 31 and 88).
		l. Defective wiring between A26 and A20.	*l.* Check continuity between pin 6 of A26 and pin B of J16. Check physical condition of J16 (fig. 31 and 88).
		m. Defective wiring between A20 and A9.	*m.* Check continuity between pin F of J16 and pin 1 of J5. Check physical condition of J5.
		n. Defective wiring between A9 and A8.	*n.* Check continuity between pins 4 and 5 of J6 (fig. 31 and 88).
		o. Defective wiring between A8 and A7.	*o.* Check continuity between pins 8 and 9 of J6, and between pins 7 and 10 of J6 (fig. 31 and 88).
		p. Defective wiring between A7 and A6.	*p.* Check continuity between pins 11 and 14 of J6, and pins 12 and 13 of J6 (fig. 31 and 88).
		q. Defective wiring between A6 and A29.	*q.* Check continuity between pin 10 of J5 (fig. 31) and pin 6 of A29 (fig. 88).
		r. Defective C3 and C4 ----------	*r.* Check C3 and C4 by substitution (fig. 88).
		s. Defective components in A29 --	*s.* Perform voltage and resistance measurements for A29 (para 39) to determine the faulty component.
5	Transmits and receives signals on wrong channel on either band.	Defective fss circuitry ----------	Perform the procedures outlined in item 12 of (1) above.
6	Transmits signal on wrong channel on either band. Receiver operation is normal.	Defective S4, or wiring from S4 to A26. Defective wiring from A26 to A20.	Check S4. Check continuity between S4 and A26. Check continuity between pin 6 of A26 and pin B of J16 (fig. 31 and 88).
7	Transmits signal on wrong channel on one band.	*a.* Defective wiring to diode switching in A10.	*a.* Check continuity between pin 17 of A26 and pin D of J12 (fig. 31 and 88).
		b. Defective wiring between A19 and A20.	*b.* Check continuity between pin D of J15 and pin B of J16 for the low band, and between pin F of J15 and pin B of J16 for the high band (fig. 31 and 88).
8	Transmits a continuous-wave (cw) carrier but sidetone is heard in H-138/U.	Defective wiring between A22 and A20.	Check continuity between pin 1 of A22J2 (fig. 33) and pin A of J16 (fig. 33 and 88).
9	Transmits a cw carrier but no sidetone is heard in H-138/U when the function switch is at ON.	*a.* Defective FL1 or FL2. Defective wiring from FL1 or FL2 to A22.	*a.* Check physical condition of FL1 and FL2 (fig. 34 and 88). Check continuity between pins D of FL1 and FL2 and pin 4 of A22J1 (fig. 33 and 88). Check physical condition of A27 printed wiring (fig. 34 and 88).
		b. Defective +10-volt regulated wiring to A22.	*b.* Check continuity between pin 9 of A30 and pin 2 of A22J2 (fig. 33 and 88).
10	Transmits a modulated carrier but no sidetone is heard in H-138/U when the function switch is at ON.	Defective wiring between A22 and A25.	Check continuity between pin 2 of A22J1 and pin 4 of A25J2 (fig. 33 and 88).
11	Transmits a modulated carrier but no sidetone is heard in the H-138/U in either the transmit or receive mode of operation when the function switch is at SQUELCH.	Defective squelch circuitry -----	Perform the procedures outlined in item 9 of (1) above.
12	Transmits a modulated carrier but no sidetone is heard in the H-138/U when the function switch	Defective wiring between A23 and A24.	Check continuity between pin 1 of A23J1 and pin 4 of A24J1 (fig. 33 and 88).

Item	Indication	Probable trouble	Procedure
	is at SQUELCH. Receiver operation is normal.		
13	Transmits a modulated carrier that cannot be received when an RT-505/PRC-25 at the receiving site is in the SQUELCH mode of operation. Sidetone is heard in H-138/U.	Defective wiring between A23 and A22.	Check continuity between pin 1 A23J2 and pin 4 of A22J2 (fig. 33 and 88).
14	Same as step 13 except no sidetone is heard in H-138/U.	Defective +10-volt regulated wiring to A23.	Check continuity between pin 9 of A30 and pin 2 of A23J2 (fig. 33 and 88).
15	BAND switch does not function properly.	BAND switch defective ---------	Higher echelon maintenance required.
16	Tuning knobs do not function properly.	Selector mechanism defective --	Higher echelon maintenance required.

39. Isolating Trouble in Transmitter Power Amplifier Circuit (fig. 14 and 29)

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Multimeter ME-26B/U.
- *(b)* Rf Wattmeter AN/URM-43A.
- *(c)* Handset H-138/U.

(2) Set the front panel controls of the receiver-transmitter as follows:
- *(a)* BAND switch at 30-52.
- *(b)* Tuning controls for 30.00 mc.
- *(c)* Function switch at ON.

(3) Connect the AN/URM-43A to ANT connector J2.

(4) Connect the H-138/U to an AUDIO connector.

b. Output Power Test.

(1) Press the H-138/U push-to-talk switch. The AN/URM-43A should indicate 2 watts.

(2) Release the H-138/U push-to-talk switch.

(3) Set the receiver-transmitter tuning controls for 52.95 mc.

(4) Repeat (1) and (2) above.

(5) Set the front panel controls of the receiver-transmitter as follows:
- *(a)* BAND switch at 53-75.
- *(b)* Tuning controls for 53.00 mc.

(6) Press the H-138/U push-to-talk switch. The AN/URM-43A should indicate 1.5 watts.

(7) Release the H-138/U push-to-talk switch.

(8) Set the receiver-transmitter tuning controls for 75.95 mc.

(9) Repeat (6) and (7) above.

(10) If the output does not meet the standards outlined in (1) and (6) above, proceed to *c* below.

c. Faulty Parts Isolation.

(1) Connect the AN/URM-43A to ANT connector J2. Connect the H-138/U to an AUDIO connector.

(2) Set the BAND switch at 30-52 and set the tuning controls for 30.00 mc.

(3) Press the H-138/U push-to-talk switch and measure the voltages at the points listed in the chart below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
A29-5 ----------	16
A29V1-8 ----------	16
A29V1-3 ----------	68

(b) Dc voltage chart.

Point of measurement	Voltage (dc)
A29-2 ----------	+125
A29-7 ----------	-45
A29-4 ----------	+2.5
A29V1-5 ----------	+2.5
A29V1-7 ----------	+2.5
A29V1-3 ----------	+118
A29-5 ----------	-10.2
A29V1-8 ----------	-10.2

(4) After the replacement of a faulty part, perform the procedures given in *a* and *b* above.

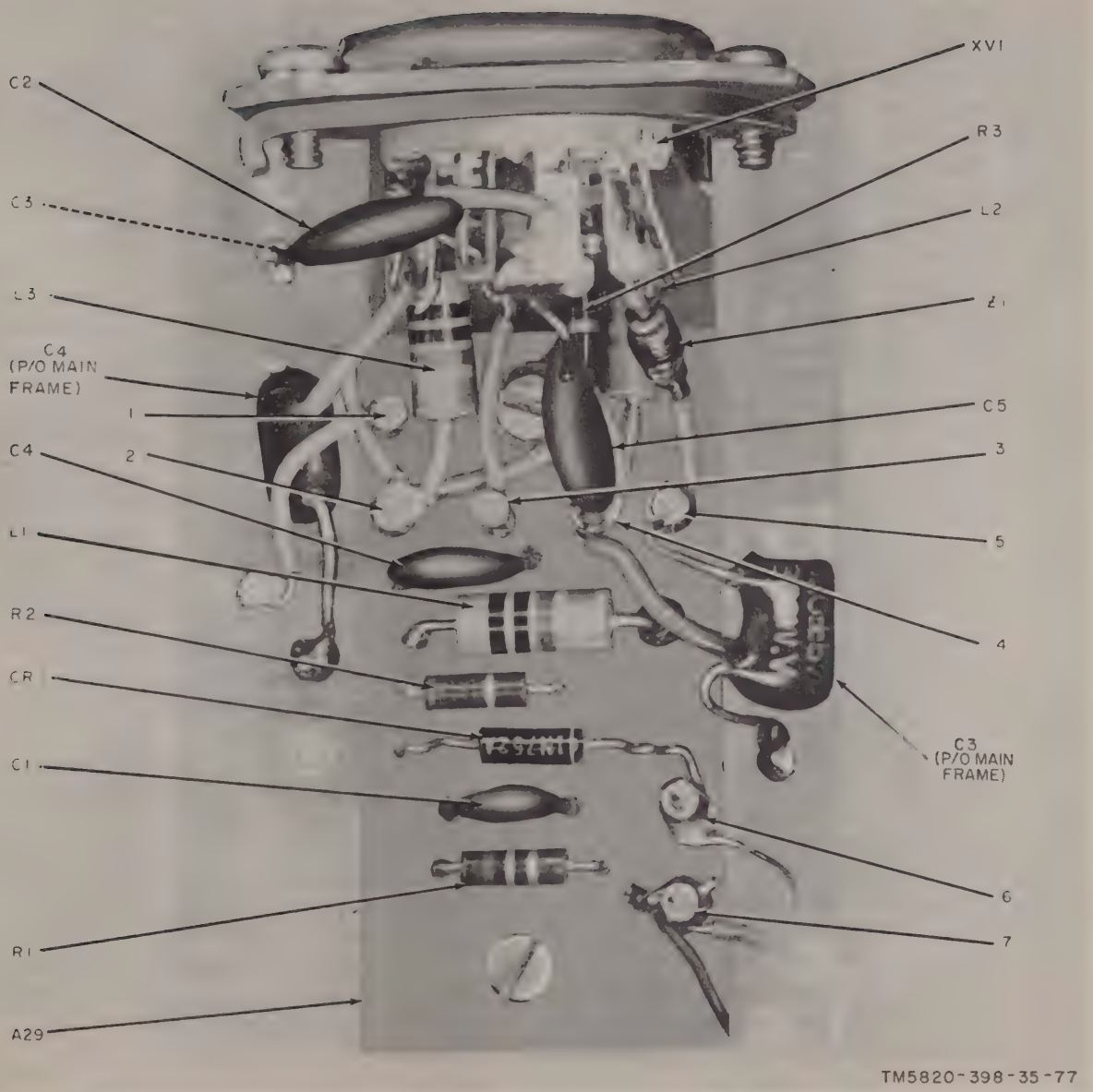


Figure 29. Transmitter power amplifier test points and parts location.

Section III. THIRD ECHELON REPAIRS

40. Scope of Third Echelon Repairs

a. The third echelon repairman may remove and replace audio and control chassis A27, the synthesizer mother board A26, and all other components within the RT-505/PRC-25.

b. Paragraphs 41 and 42 contain instructions for removing and replacing parts of the RT-505/PRC-25.

41. Removal and Replacement of Audio and Control Chassis A27 (fig. 32)

a. Removal.

(1) Remove modules A21 through A25 as described in TM 11-5820-398-20, paragraph 10*a*.
(2) Remove relay K3.
(3) Unsolder and remove 11.5-mc filter FL3.
(4) Unsolder and remove receiver discriminator Z1.
(5) Tag and unsolder all wiring to relay socket XK3 and audio and control chassis A27 terminal strip.
(6) Remove the wiring through the grommet at the lower left corner of the audio and control chassis.
(7) Using a hacksaw, cut off one end of the metal dowel protruding from the audio and control chassis A27 hinge.
(8) Grasp the other end of the metal dowel with pliers and remove the metal dowel from the hinge.
(9) Release the three audio and control chassis captive screws and separate audio and control chassis A27 from the RT-505/PRC-25.

b. Replacement.

(1) Align the hinge on audio and control chassis A27 with the hinge on RT-505/PRC-25.
(2) Insert a new metal dowel and push downward until the dowel extends through the entire hinge.
(3) Crimp the metal dowel at both ends.
(4) Insert the wiring through the grommet at the lower left corner of the audio and control chassis A27 (fig. 33) and solder all the electrical leads to XK3 and to the audio and control chassis A27 terminal strip.
(5) Replace 11.5-mc filter FL3 and solder the connections.
(6) Replace receiver discriminator Z1 and solder the connections.
(7) Replace relay K3 into socket XK3.
(8) Replace modules A21 through A25 as described in TM 11-5820-398-20, paragraph 10*b*.
(9) Secure audio and control chassis A27 with the three audio and control chassis captive screws.

42. Removal and Replacement of Synthesizer Mother Board A26 (fig. 34)

a. Removal.

(1) Remove modules A10 through A20 as described in TM 11-5820-398-20, paragraph 10*c*.
(2) Remove the 10 module nuts and bushings.
(3) Loosen the four mother board captive fasteners.
(4) Gently pull the mother board away from the chassis.
(5) Tag and unsolder all wiring to the mother board.

b. Replacement.

(1) Solder all electrical leads to the mother board.
(2) Align the four mother board captive fasteners with the holes in the chassis.
(3) Secure the mother board captive fasteners.
(4) Replace and tighten the 10 module nuts and bushings.
(5) Replace modules A10 through A20 as described in TM 11-5820-398-20, paragraph 10*d*.

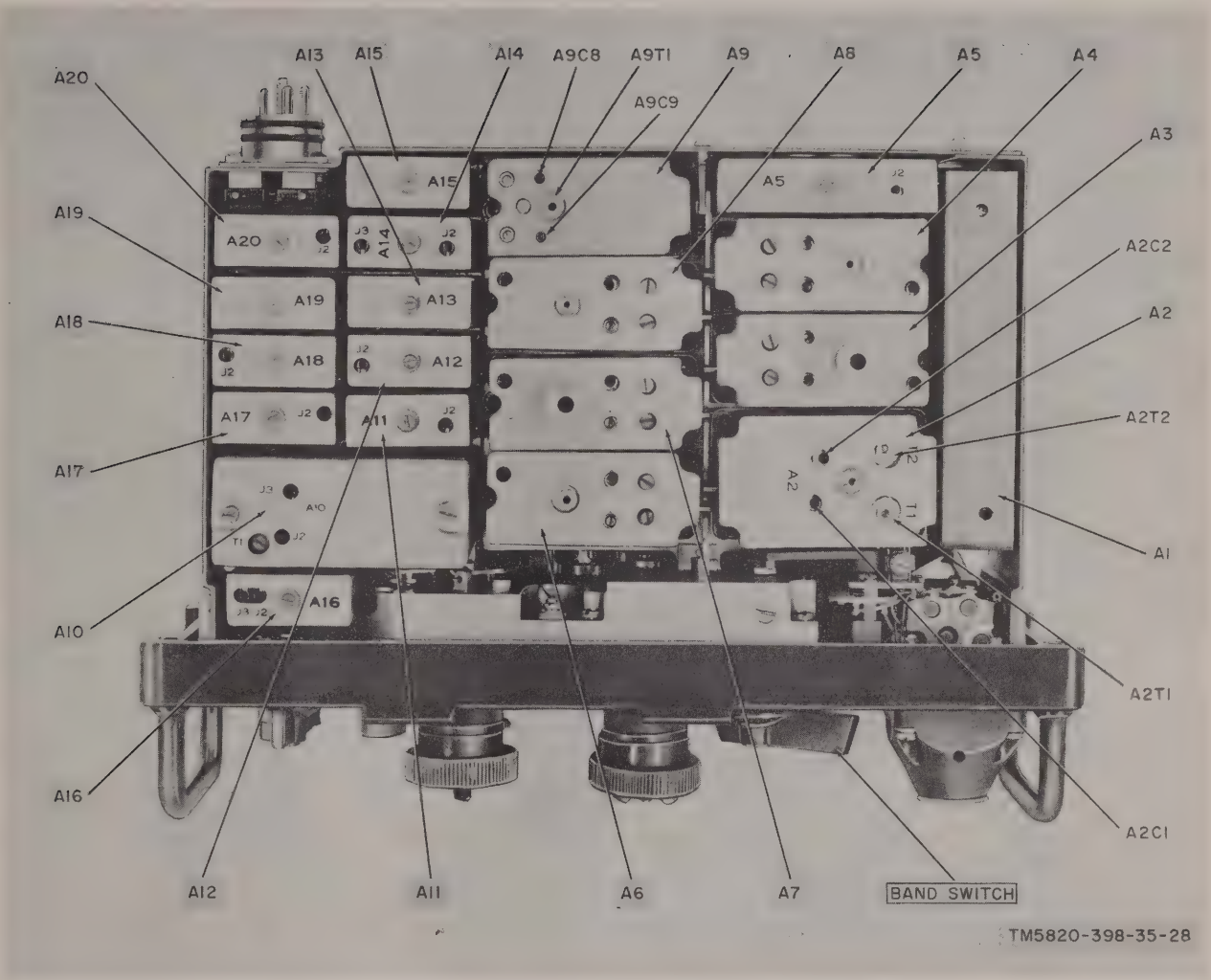


Figure 30. Receiver-Transmitter, Radio RT-505/PRC-25, bottom view.

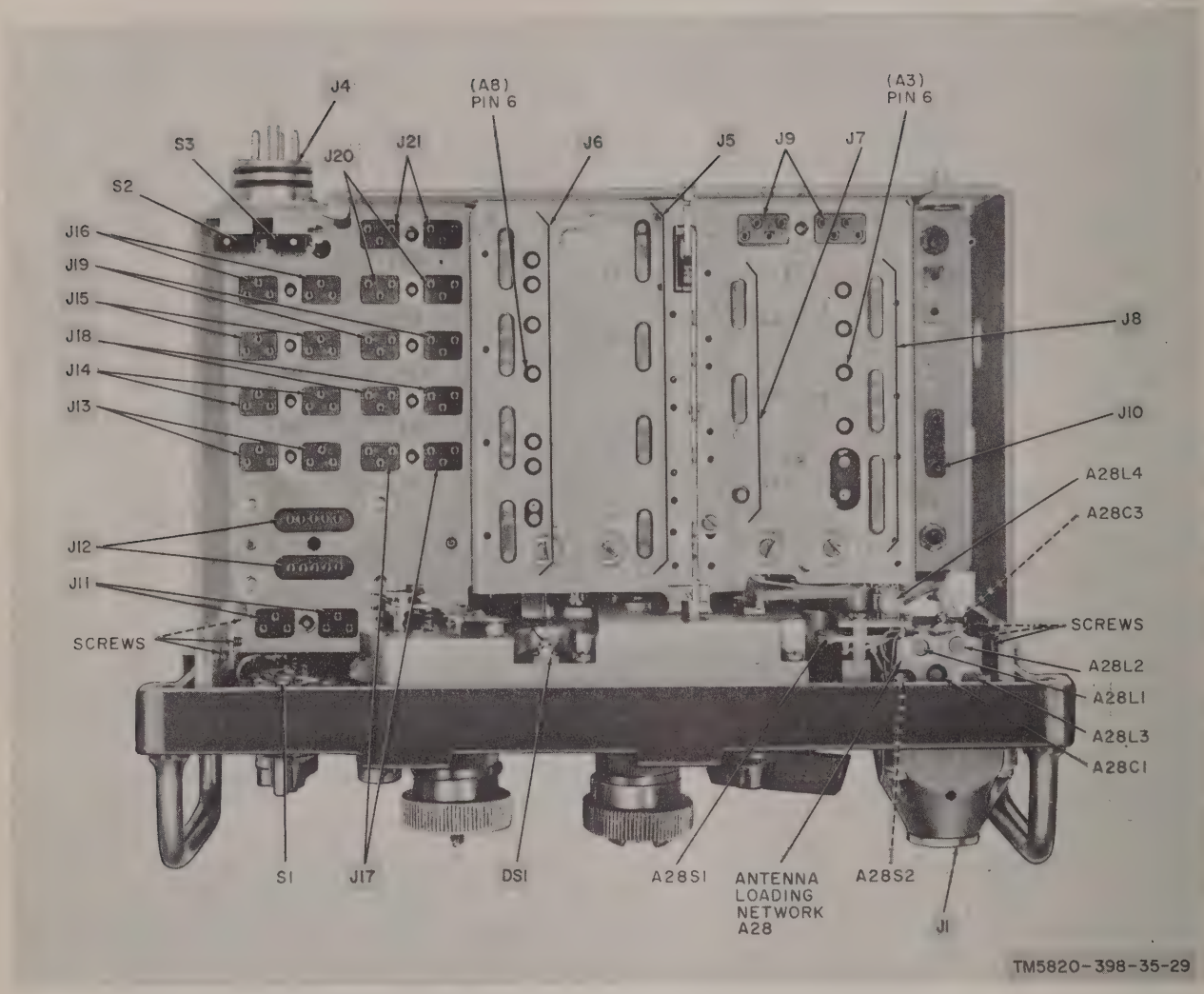


Figure 31. Receiver-Transmitter, Radio RT-505/PRC-25, bottom view, modules removed.

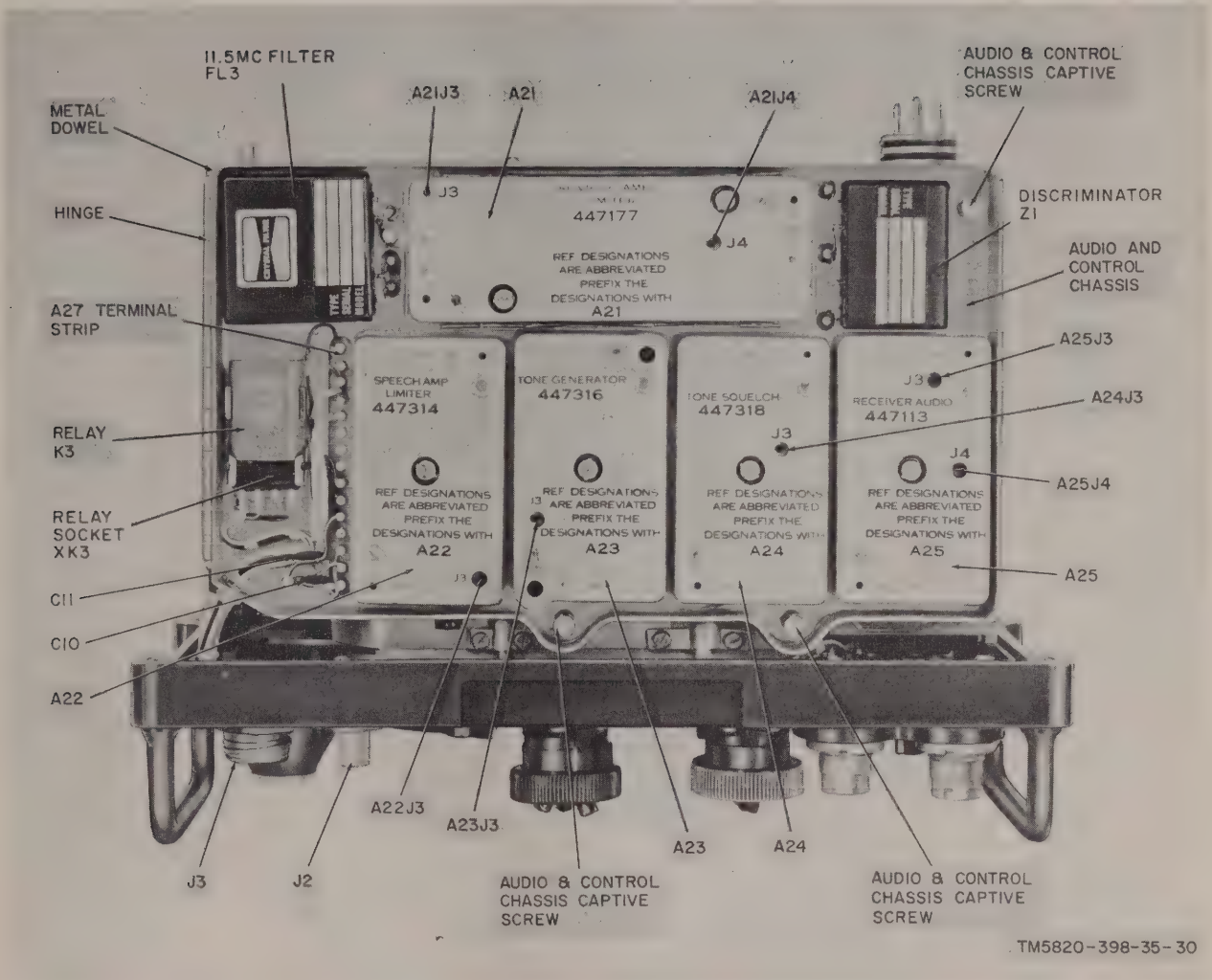


Figure 32. Receiver-Transmitter, Radio RT-505/PRC-25, top view.

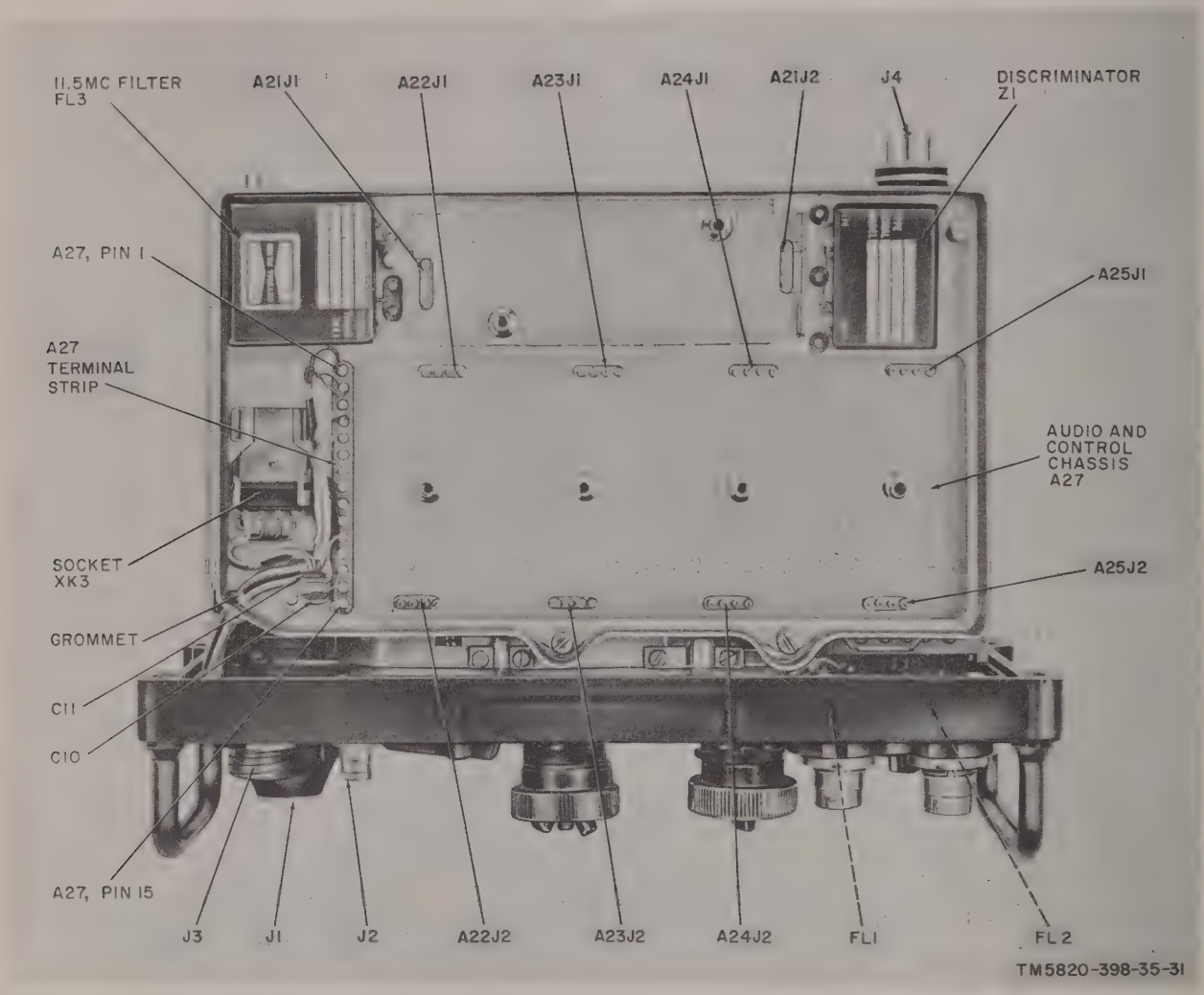


Figure 33. Receiver-Transmitter, Radio RT-505/PRC-25, top view, modules removed.

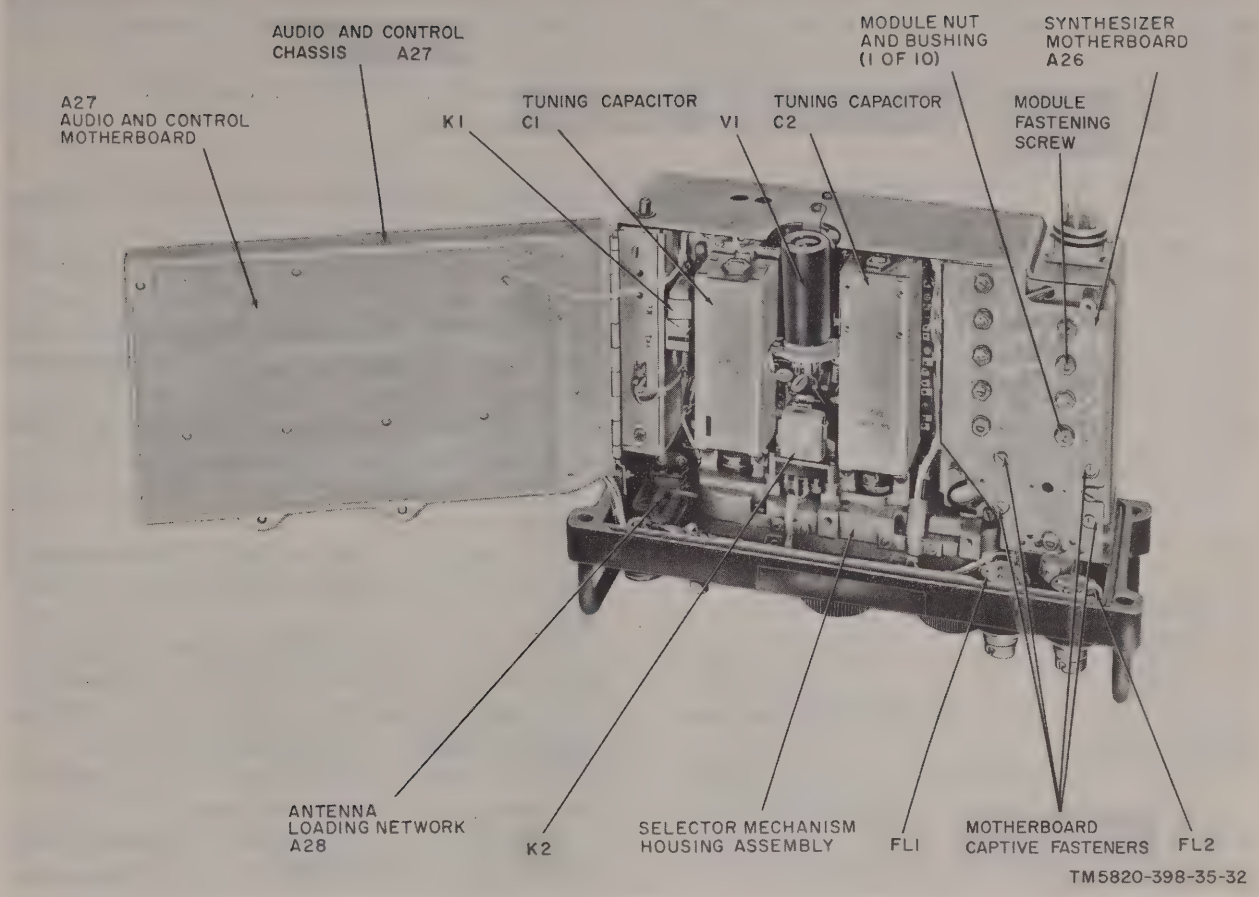


Figure 34. Receiver-Transmitter, Radio RT-505/PRC-25, top view, audio and control chassis A27 open.

Section IV. THIRD ECHELON ALIGNMENT

Note: Third echelon alignment consists of aligning transmitter power amplifier tank module A2, variable frequency oscillator module A9, and sidestep oscillator module A20.

43. Alignment of Power Amplifier Tank Module A2 (fig. 30 and 31)

a. Set the rf output of the AN/URM-48 for 30.00 mc, modulated ±10 kc by a 1,000-cycle-per-second (cps) tone.

b. Connect the RF output lead of the AN/URM-48 to receiver-transmitter ANT jack J2.

c. Set the BAND switch of the receiver-transmitter at 30-52, and the tuning controls for 30.00 mc.

d. Adjust the ME-26B/U to measure ac voltage and connect it across pins A and B of one of the receiver-transmitter AUDIO connectors.

e. Adjust A2T1 for a maximum indication on the ME-26B/U.

f. Set the rf output of the AN/URM-48 for 52.95 mc, modulated ±10 kc by a 1,000-cps tone.

g. Set the receiver-transmitter tuning controls for 52.95 mc.

h. Adjust A2C1 for a maximum indication on the ME-26B/U.

i. Repeat *c* through *h* above until no further increase in the ME-26B/U meter indication can be obtained.

j. Set the rf output of the AN/URM-48 for 53.00 mc, modulated ±10 kc by a 1,000-cps tone.

k. Set the BAND switch of the receiver-transmitter at 53-75, and the tuning controls for 53.00 mc.

l. Adjust A2T2 for a maximum indication on the ME-26B/U.

m. Set the rf output of the AN/URM-48 for 75.95 mc, modulated ±10 kc by a 1,000-cps tone.

n. Set the receiver-transmitter tuning controls for 75.95 mc.

o. Adjust A2C2 for a maximum indication on the ME-26B/U.

p. Repeat *k* through *o* above until no further increase in the ME-26B/U meter indication can be obtained.

44. Alignment of Variable Frequency Oscillator Module A9
(fig. 30 and 31)

a. Connect the AN/USM-26 between A14J2 and ground.

b. Set the receiver-transmitter BAND switch to 30-52, and the tuning controls to 30.00 mc.

c. Press and hold S2 and S3.

d. Adjust A9T1 until the AN/USM-26 indicates a frequency of 41.500 mc.

e. Release S2 and S3.

f. Set the receiver-transmitter tuning controls to 52.95 mc.

g. Press and hold S2 and S3.

h. Adjust A9C9 until the AN/USM-26 indicates a frequency of 64.450 mc.

i. Release S2 and S3.

j. Repeat *b* through *i* above several times to insure proper alignment of A9.

45. Alignment of Sidestep Oscillator Module A20
(fig. 30 and 31)

a. Remove module A20 (TM 11-5820-398-20, para 10*c*).

b. Insert the module extender (fig. 27) into J16.

c. Remove the cover from module A20 and place the module cover (fig. 28) on the module.

d. Connect module A20 to the module extender (fig. 27).

e. Set the receiver-transmitter BAND switch at 30-52.

f. Connect the AN/USM-26 between A20J2 (top of module A20) and ground (fig. 30).

g. Connect the AN/URM-43A to receiver-transmitter ANT connector J2.

h. Connect an RF millivoltmeter 411A between A20J2 and ground (fig. 30).

i. Connect the H-138/U to a receiver-transmitter AUDIO connector.

j. Press the H-138/U push-to-talk switch and adjust A20T1 for an indication of 11.451 mc ±500 cps on the AN/USM-26.

k. Adjust A20T2 for a maximum indication on the 411A.

l. Remove module A20 and the module extender from J16.

m. Remove the module alignment cover from module A20.

n. Replace the cover on module A20.

o. Replace module A20 (TM 11-5820-398-20, para 10*d*).

CHAPTER 4

FOURTH ECHELON MAINTENANCE

Section I. FOURTH ECHELON REPAIRS

46. Scope of Fourth Echelon Repairs

Fourth echelon maintenance includes those functions allocated to third echelon maintenance (ch 3). In addition, it also includes removal and replacement of the front panel and the selector mechanism housing assembly, and alignment of tuning capacitors C1 and C2.

47. Removal and Replacement of Front Panel

a. Removal.

(1) Remove modules A2, A6, A10, and A16.
(2) Remove the Allen head screw that secures the module band positioning arm to the yoke assembly (fig. 35).
(3) Remove the lamp receptacle screw and its lockwasher and flatwasher (fig. 35). Remove the lamp receptacle and the lamp.
(4) Loosen the three audio and control chassis captive screws that secure the audio and control chassis, and swing the chassis away (fig. 36).
(5) Unsolder and tag the wire connected to the contact on left side of tuning capacitor C2 (fig. 39).
(6) Unsolder and tag the shield and center conductor of the coaxial cable connected to ANT connector (fig. 39).
(7) Remove the two clamps that secure the electrical leads to the selector mechanism housing assembly (fig. 36).
(8) Remove the two screws that secure the relay socket to the spacer legs and remove the assembly (fig. 39).
(9) Remove the four screws that secure the two tuning capacitors C1 and C2 to the selector mechanism housing assembly.
(10) Loosen the clamps around the shafts of tuning capacitors C1 and C2.
(11) Remove the two screws that secure the selector mechanism housing assembly to the chassis.
(12) Remove the six screws that secure the front panel to the chassis (fig. 31).
(13) Remove the nuts (fig. 37) on the front panel that secure the AUDIO connectors in place.
(14) Remove the POWER connector nut (fig. 37).
(15) Remove the VOLUME control retaining screw and the VOLUME control knob (fig. 37). A retaining nut, and a lockwasher are under the knob; remove them.
(16) Remove the function switch retaining screw and the function switch knob. A retaining nut is under the knob; remove it.
(17) Gently pull the front panel away from the chassis.

Note: It may be necessary to loosen or remove the three screws that secure the antenna loading network (fig. 39) to the front panel so that the POWER connector can be worked loose.

b. Replacement.

(1) Secure the POWER and AUDIO connectors in their respective openings on the front panel with the retaining nut.

Note: If necessary, tighten the three screws that secure the antenna loading network to the front panel after the POWER connector has been replaced.

(2) Replace the function switch shaft nut and knob.
(3) Replace the star washer, retaining nut, knob, the VOLUME control, the lockwasher, nut, and knob.
(4) Replace the six screws that secure the chassis to the front panel.
(5) Replace the two screws that

secure the selector mechanism housing assembly to the chassis.

(6) Replace tuning capacitors C1 and C2 and secure them with four screws.

Note: Do not tighten the clamp on the shaft of tuning capacitors C1 and C2 at this time.

(7) Replace the relay socket assembly on the spacer legs and secure it with screws.

(8) Replace the clamps that secure the electrical leads to the selector mechanism housing assembly.

(9) Solder the shield and center conductor to ANT connector J2.

(10) Solder the wire removed in *a*(5) above to the contact on the left side of tuning capacitor C2.

(11) Replace the lamp in the lamp receptacle and secure it to the selector mechanism housing assembly with the flat washer, lockwasher, and screw.

(12) Place the module band positioning arm into the yoke assembly and secure with the Allen head screw.

(13) Replace modules A2, A6, A10, and A16 (TM 11-5820-398-20, para 10).

(14) Align tuning capacitors C1 and C2 (para 50 and 51).

(15) Close the audio and control chassis

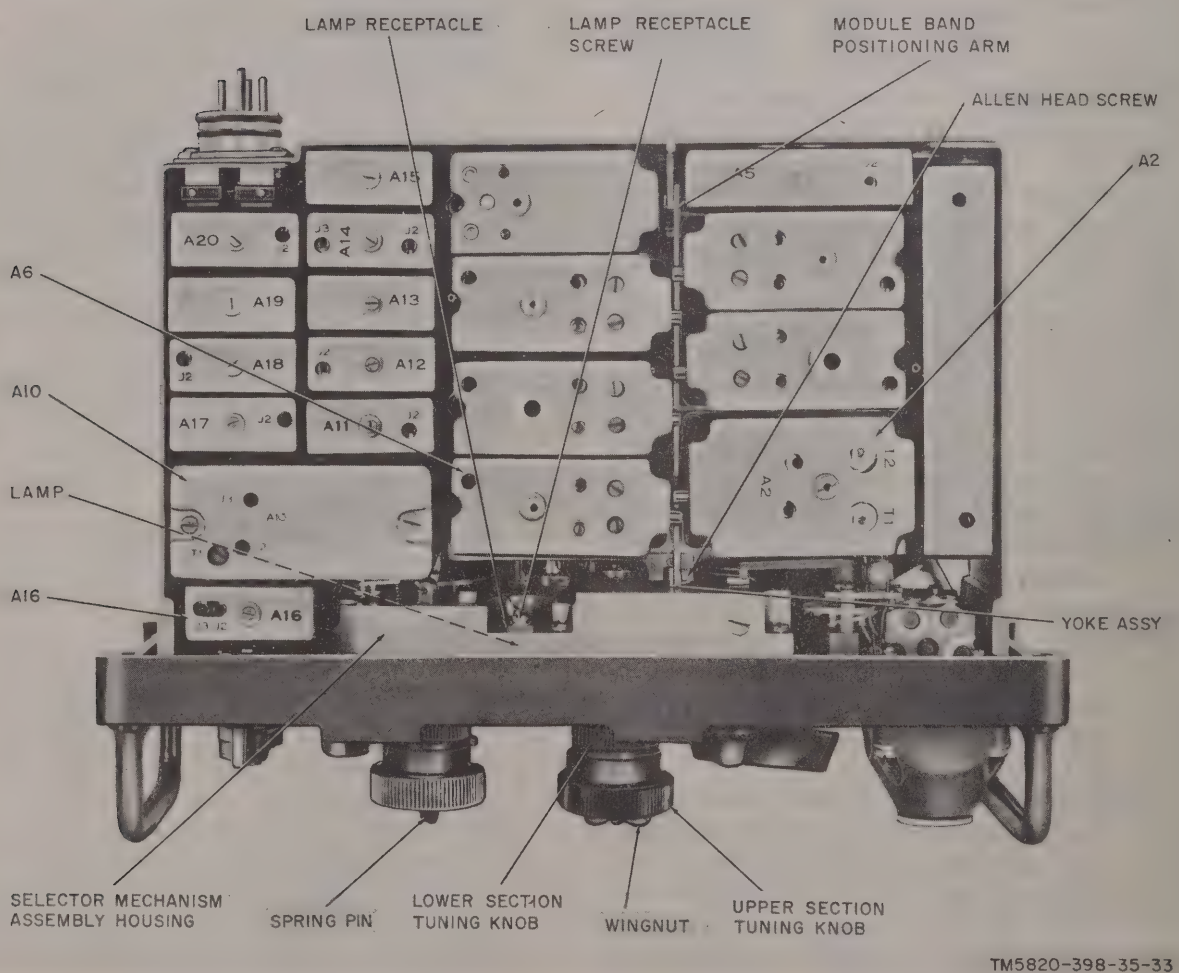


Figure 35. Receiver-Transmitter, Radio RT-505/PRC-25, bottom view, disassembly.

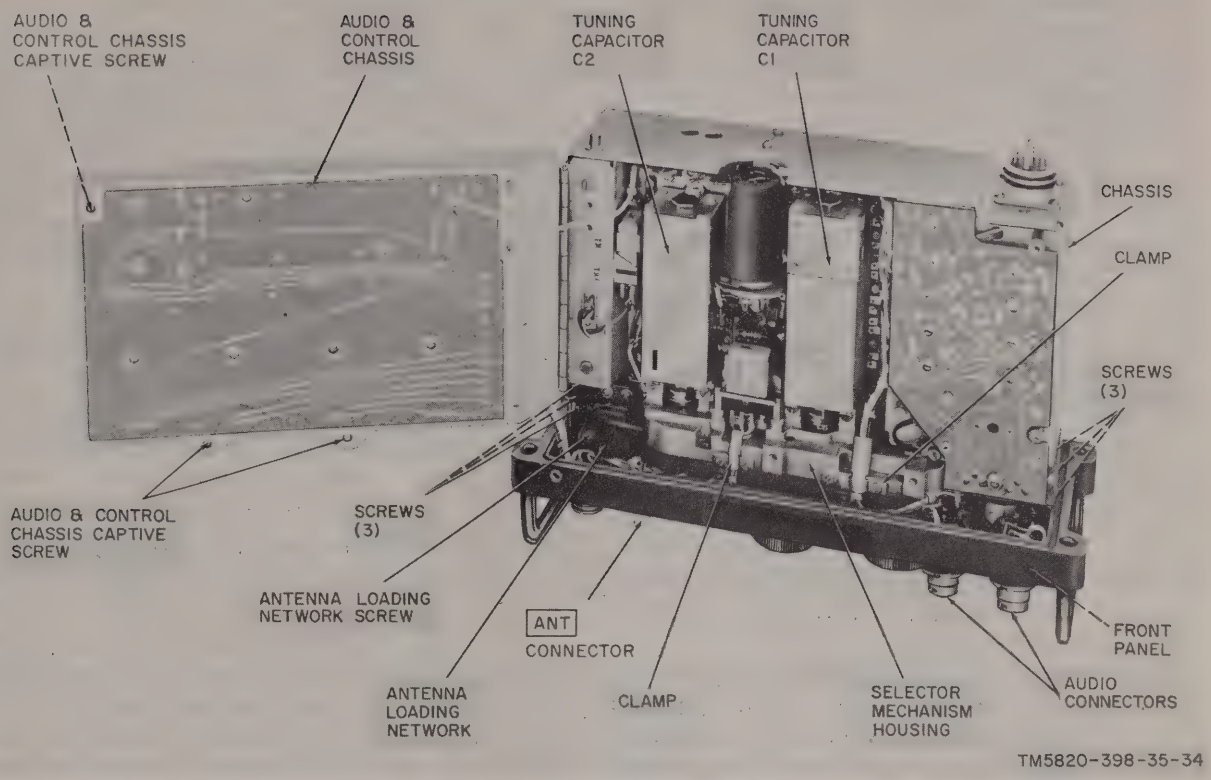


Figure 36. Receiver-Transmitter, Radio RT-505/PRC-25, top view, audio and control chassis open.

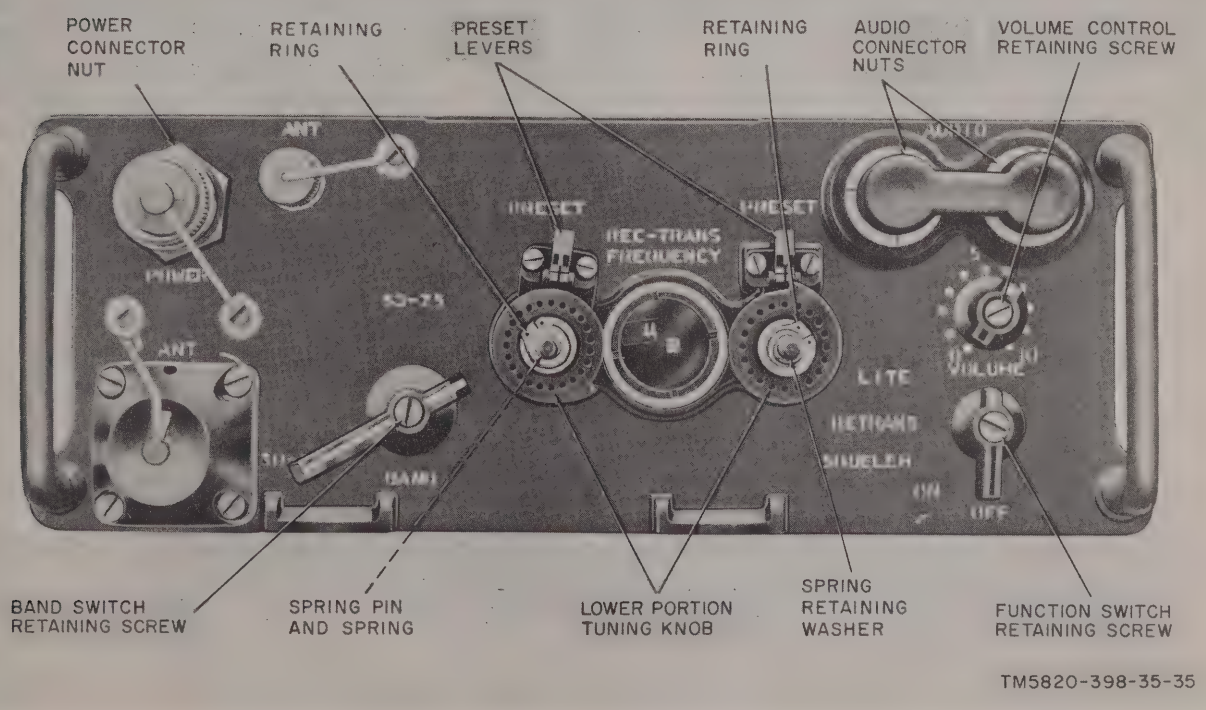


Figure 37. Receiver-Transmitter, Radio RT-505/PRC-25, front panel, tuning knobs removed.

and secure it with the three audio and control chassis captive screws.

48. Removal and Replacement of Selector Mechanism (fig. 37, 38, and 40)

a. Removal.

(1) Remove the front panel (para 47).

(2) Remove the receiver-transmitter tuning knobs as follows (fig. 40):

Note: Removal of the mc and the kc tuning knob assemblies from their respective shafts is identical. Removal of the kc stop assembly can be accomplished without disassembling the kc tuning knob assembly. Removal of the mc stop assembly and plate mounting, however, requires the disassembly and removal of the entire mc tuning knob assembly.

(a) Remove the roll pin that retains the wingnut on the selector mechanism shaft.

(b) Remove the wingnut, lockwasher, flat washer, and upper knob.

(c) Remove the tru-arc retaining ring from the sleeve assembly and remove the retaining washer and spring.

(d) Remove the lower knob.

(e) Remove the spring pin that secures the sleeve assembly to the selector mechanism shaft.

(f) Remove the sleeve assembly.

(g) Remove the stop assembly and plate mounting (PRESET mechanical lever) on the mc tuning knob shaft by removing the four fillister head screws around the shaft.

(h) Remove the stop assembly (PRESET mechanical lever) on the kc tuning knob shaft by removing the two screws and two washers that secure it to the front panel.

(3) Remove the BAND switch retaining screw that secures the BAND switch knob (fig. 37) to the shaft and remove the BAND switch knob.

(4) Remove the dust seal from the selector mechanism housing assembly (fig. 38).

(5) Remove the five selector mechanism securing screws that secure the selector mechanism housing assembly to the front panel.

(6) Separate the selector mechanism housing assembly from the front panel by tapping the receiver-transmitter tuning knobs gently.

b. Replacement.

(1) Reassemble the selector mechanism housing assembly and front panel.

(2) Replace the five selector mechanism securing screws that secure the selector mechanism housing assembly to the front panel.

(3) Replace the dust seal.

(4) Replace the BAND switch knob to the shaft and secure the knob with the BAND switch retaining screw.

(5) Replace the receiver-transmitter tuning knobs as follows:

(a) Replace the stop assembly (PRESET mechanical lever) on the kc tuning knob shaft and secure it to the front panel with two screws and two washers.

(b) Replace the stop assembly and plate mounting (PRESET mechanical lever) on the mc tuning knob shaft and secure with the four fillister head screws around the shaft.

(c) Replace the sleeve assembly.

(d) Replace the spring pin that secures the sleeve assembly to the shaft.

(e) Replace the lower knob.

(f) Replace the spring, retaining washer, and tru-arc retaining ring.

(g) Replace the upper knob.

(h) Replace the flat washer, lockwasher, and wingnut.

(i) Replace the roll pin that retains wingnut on shaft.

(6) Replace front panel (para 47*b*).

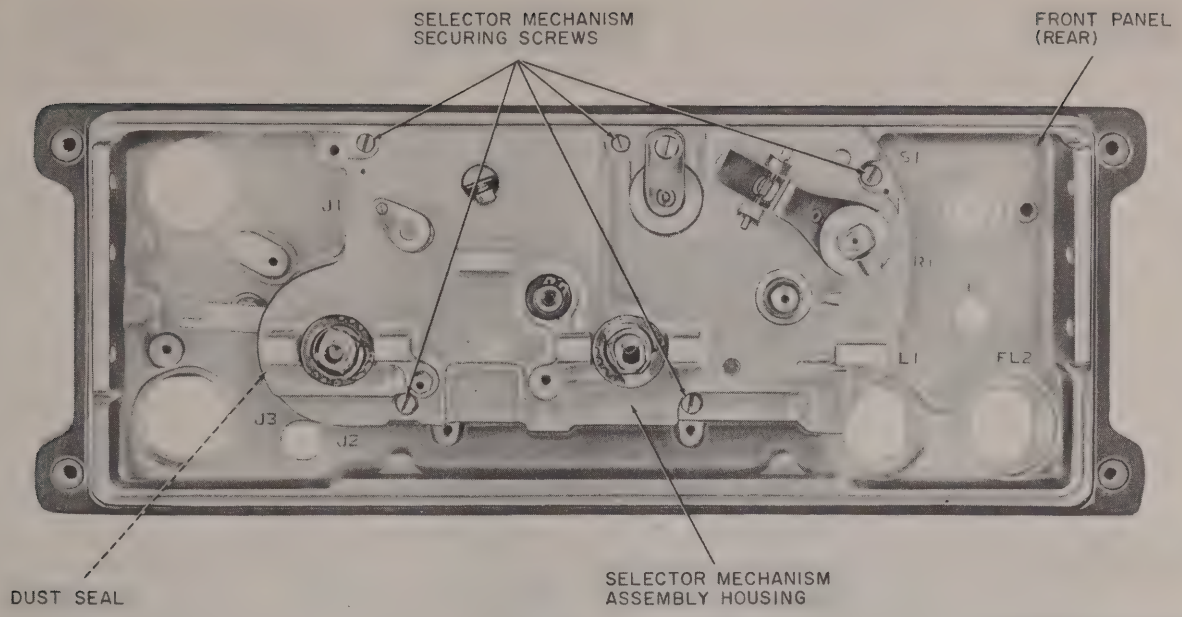


Figure 38. Front panel, rear view.

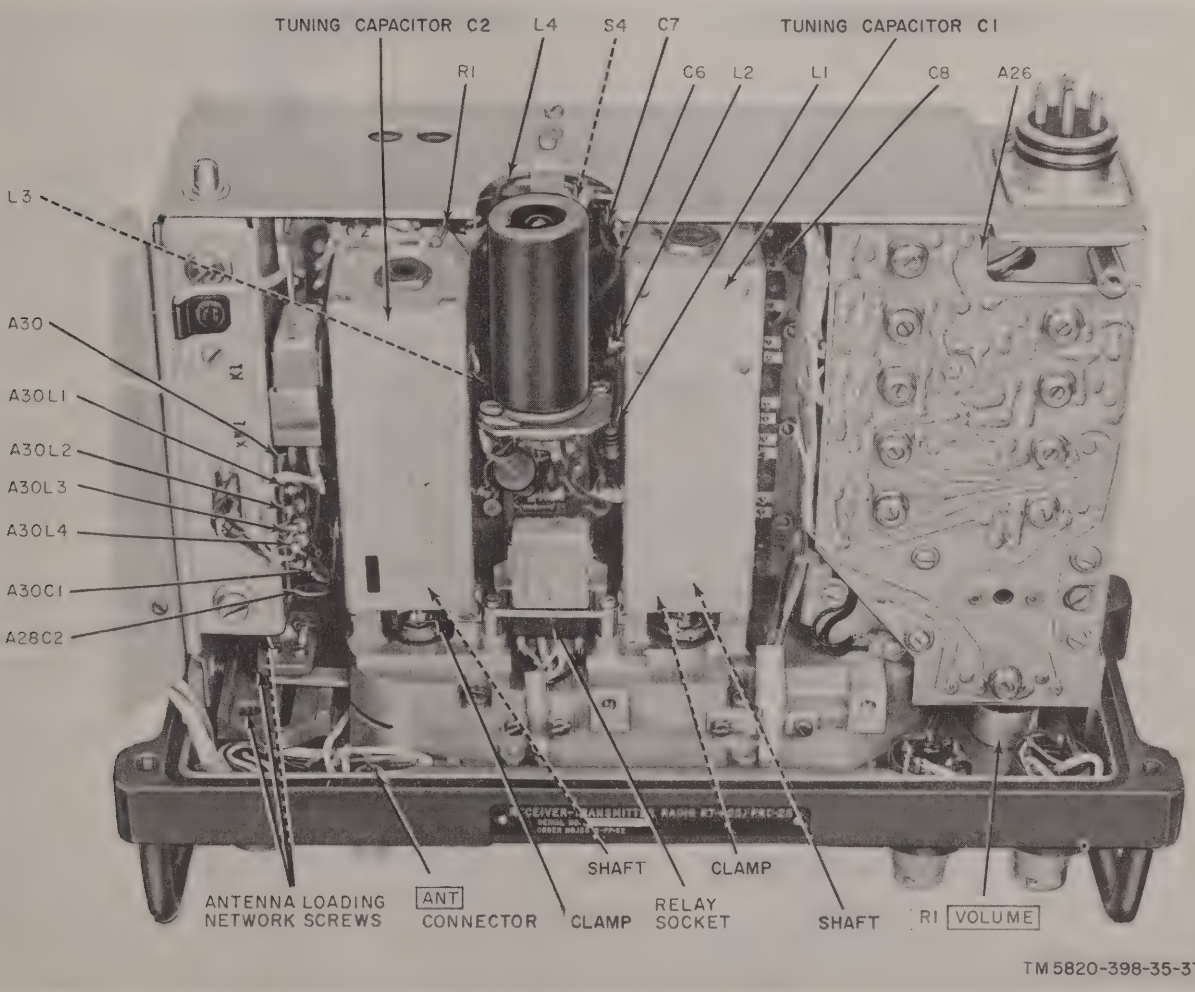


Figure 39. Tuning capacitor assembly.

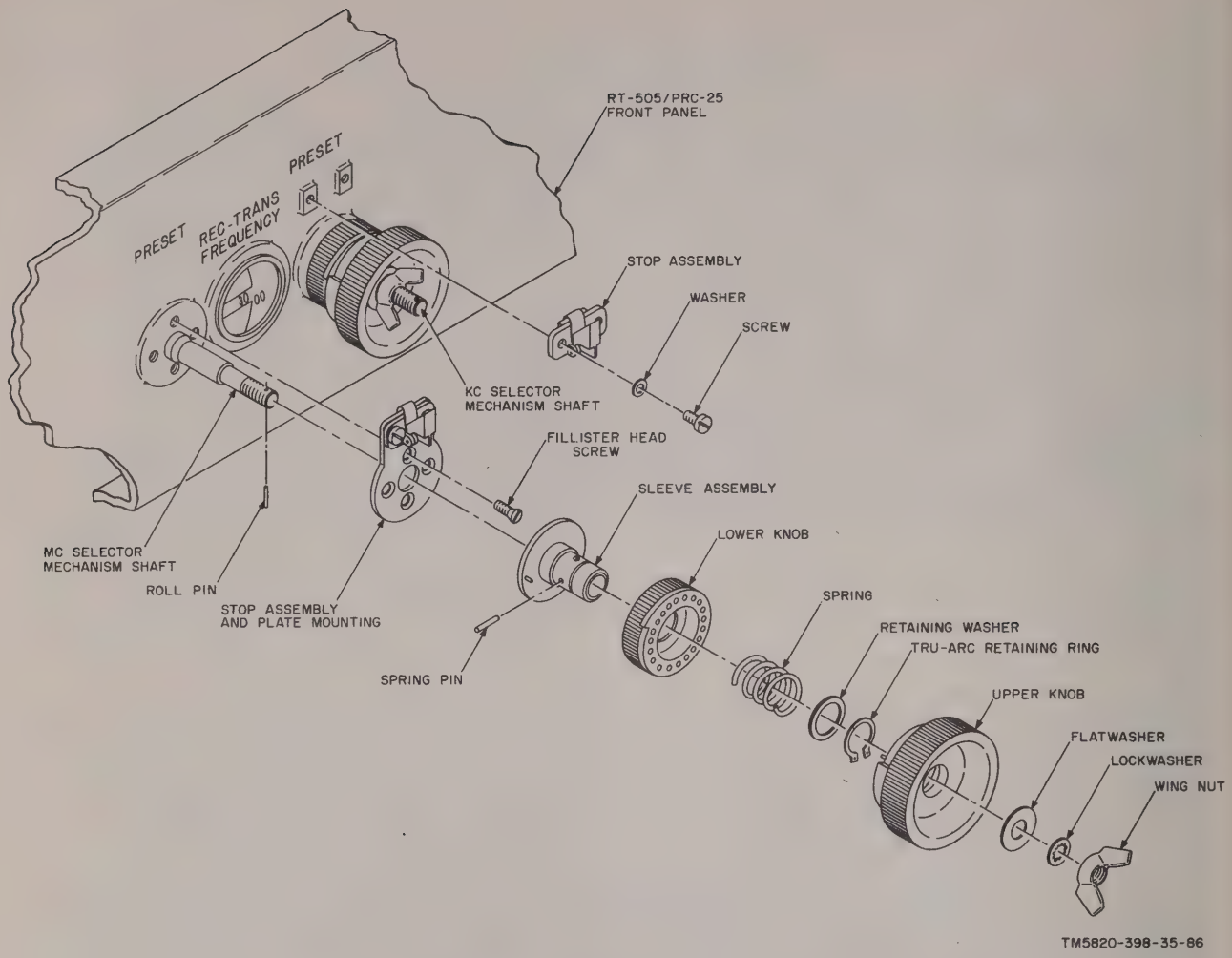


Figure 40. Tuning knob assembly.

Section II. FOURTH ECHELON ALIGNMENT

49. General

a. Scope of Fourth Echelon Alignment Procedures. Fourth echelon alignment consists of aligning tuning capacitors C1 and C2. These capacitors must be aligned whenever the front panel is replaced, or whenever tuning capacitor C1 or C2 is replaced.

b. Equipment Required. A Ballantine Direct Capacity Meter Model 520 or equivalent is required.

50. Tuning Capacitor C1 Alignment (fig. 39)

Align tuning capacitor C1 as outlined in *a* through *h* below. Do not change the control settings unless specifically directed.

a. Remove module A8 from the chassis.

b. Adjust the RT-505/PRC-25 tuning knobs for 30.00 mc and set the BAND switch at 30-52.

c. Use a Ballantine Direct Capacity Meter Model 520, or equivalent. Connect the ground lead of the 520 to the RT-505/PRC-25 chassis.

d. Connect the other lead from the 520 to the stator section of tuning capacitor C1 at (A8) pin 6 (fig. 31).

e. Set the 520 to the X10 uuf scale, loosen the clamp on the C1 tuning shaft, and adjust the shaft of tuning capacitor C1 for an indication of 6.8 on the 520.

Note: Check to see that this adjustment has been made on the proper side of the capacity-per-degree

rotation curve by turning C1 *counterclockwise* (from shaft end) and noting that the 520 indicates a *decrease* in capacity. Reset to 68 microfarads (uuf).

f. Tighten clamp on the C1 tuning shaft.

g. Adjust the RT-505/PRC-25 tuning knobs to 52.95. The 520 should indicate 10 uuf, or a difference of 58 uuf from the 30.00 mc indication (*e* above).

h. If a difference of approximately 58 uuf is not obtained, repeat the procedure given in *b* through *g* above.

i. Replace module A8 in the chassis.

51. Alignment of Tuning Capacitor C2 (fig. 39)

Align tuning capacitor C2 as outlined below. Do not change the control settings unless specifically directed.

a. Remove module A3 from the chassis.

b. Adjust the tuning knobs for 30.00 mc and set the BAND switch at 30-52.

c. Use a Ballantine Direct Capacity Meter Model 520 or equivalent. Connect the ground lead to the RT-505/PRC chassis.

d. Connect the other lead of the 520 to the stator section of tuning capacitor C2 at A3, pin 6 (fig. 31).

e. Set the 520 on the X10 uuf scale, loosen the clamp on the C1 tuning shaft, and adjust the shaft of the tuning capacitor C2 for an indication of 6.8 on the 520.

Note: Check to see that this adjustment has been made on the proper side of the capacity-per-degree rotation curve by turning C2 *clockwise* (from shaft end) and noting that the 520 indicates a *decrease* in capacity; reset to 68 uuf.

f. Tighten the clamp on the C2 tuning shaft.

g. Adjust the tuning knobs to 52.95 mc. The 520 should indicate a difference of approximately 58 uuf.

h. If a difference of approximately 58 uuf is not obtained, repeat the procedure given in *b* through *g* above.

i. Replace module A3 in the chassis.

Section III. FOURTH ECHELON TESTING PROCEDURES

52. General

a. The testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service organizations responsible for fourth echelon maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that a repaired Receiver-Transmitter, Radio RT-505/PRC-25 must meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment at third echelon if the proper tools and test equipments are available. A summary of the performance standards is given in paragraph 67.

b. Comply with the instructions preceding each chart before proceeding to the chart. Perform each test in sequence. *Do not vary the sequence.* For each step, perform all the actions required in the *Test equipment control settings* and *Equipment under test control settings* columns; then perform each specific test procedure and verify it against its performance standard.

53. Test Equipment, Tools, Materials, and Additional Equipment Required

a. General. All test equipment, tools, materials, and other equipment required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA 11-17, Signal Field Maintenance Shops, and TA 11-100(11-17), Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United States.

b. Special Requirements.

(1) Specific models of test equipment were used to perform the test procedures given in paragraphs 56 through 66. If these test procedures are performed using other models of the test equipments, it may be necessary to allow for test con-

nections or test indications that may differ from those given in the test procedures.

(2) Unless otherwise specified, all tests are to be performed with the RT-505/PRC-25 connected to Battery, Dry BA-386/PRC-25.

(3) The electrical tests should be conducted in a screen room. If available, use Inclosure, Electromagnetic Shielding MX-1761/G or its equivalent.

c. Test Equipment.

Nomenclature	Technical manual
Audio Oscillator TS-382F/U.	TM 11-6625-261-12
Voltmeter, Meter ME-30A/U	TM 11-6625-320-12
Frequency Meter AN/USM-26.	TM 11-5057
RF Wattmeter AN/URM-43A	TM 11-5133
Signal Generator AN/URM-48 (two required).	TM 11-1257
Spectrum Analyzer TS-723A/U.	TM 11-5097
Meter, Modulation ME-57/U	TM 11-6625-400-12
Radio Set AN/PRC-25 ------	TM 11-5820-398-10
Multimeter ME-26B/U -----	TM 11-6625-200-12

d. Additional Equipment.

Nomenclature	Federal stock No.
Inclosure, Electromagnetic Shielding MX-1761/G or equivalent.	4940-542-0002
Tool Kit TK-87/U ----------	5180-690-4452
Resistors:	
1,000 ohms, ±1%, 5 watts	
10,000 ohms ±5%, 1 watt, variable.	5905-892-6543
15,000 ohms ±5%, 1 watt ---	5905-102-2824
Capacitor, 0.05 uf ±10%, 600 vdc.	5910-112-7619
Dummy antenna, consisting of:[a]	
Resistor, 56 ohms, 1 watt (two required)	
Resistor, 510 ohms, 1 watt, ±5%.	5905-114-1607
Connector UG-447/U (two required).	
Aluminum container, 6 in. by 2-1/2 in. by 2-1/2 in.	None
Wire, stranded AWG No. 18 (as required).	6145-160-5291
Adapter, UG-274B/U	
Cable Assembly, Radio Frequency CG-1773/U.	5995-823-2985
Toggle switch, single pole, single throw.	5930-655-1517
Test cable No. 1, consisting of:[a]	
Connector UG-88/U	
Cable, RG-58/U (36 inches)	6145-542-6092
Test cable No. 2, consisting of:[a]	
Clip, Electrical, Alligator style.	5940-186-9833
Wire, stranded AWG No. 18.	6145-160-5291

[a]Must be fabricated by maintenance personnel (para 54).

54. Fabrication of Test Cables and Dummy Antenna

a. Dummy Antenna. A special 50-ohm 20-db pad (dummy antenna) is required to couple the output of Signal Generator AN/URM-48 to the input of the RT-505/PRC-25. Fabricate the special 50-ohm, 20-db dummy antenna as shown in figure 41.

b. Test Cable No. 1. Fabricate test cable No. 1 as illustrated in figure 41.

c. Test Cable No. 2. Fabricate test cable No. 2 as illustrated in figure 41.

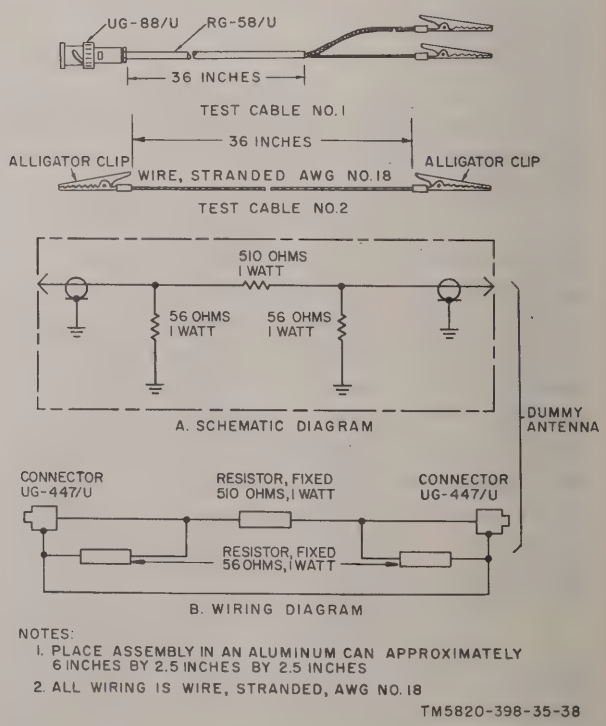


Figure 41. Fabrication details for test cables and special dummy antenna.

55. Physical Tests and Inspection

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. Remove Battery Box CY-2562/PRC-25, Battery, Dry BA-386/PRC-25, and the receiver-transmitter case.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	N/A ----------	Controls may be in any position.	*a.* Inspect all controls and external assemblies for loose or missing screws. *b.* Inspect connectors for looseness or damage----- *c.* Inspect the receiver-transmitter case and front panel for damage, missing parts, and condition of finish. *Note:* Touchup painting is recommended in lieu of refinishing wherever practicable. Screwheads and connectors will not be painted or polished with abrasives.	*a.* Screws will be tight; none missing. *b.* No looseness or damage evident. *c.* No damage or missing parts evident. Painted external surfaces will not show bare metal. Panel lettering will be legible.
2	N/A----------	Controls may be in any position.	*a.* Turn the BAND and function switches to each of their operating positions. *b.* Turn the VOLUME and REC-TRANS FREQUENCY (mc and kc) controls throughout their limits of travel. *Note:* Controls will rotate through 360°.	*a.* Switches operate freely, without binding or excessive looseness. *b.* Controls rotate freely, without binding or excessive looseness.
3	N/A----------	Controls may be in any positions.	*a.* Loosen captive screws securing audio and control mother board and swing mother board out on its hinges. Inspect the mother board for loose or missing screws. *b.* Inspect connections for looseness or damage ----	*a.* Screws will be tight; none missing. *b.* No looseness or damage evident.
4	N/A----------	Controls may be in any position.	*a.* Inspect modules for loose or missing screws---- *b.* Inspect connectors for looseness or damage ----	*a.* Screws will be tight; none missing. *b.* Connectors will be undamaged and firmly seated.

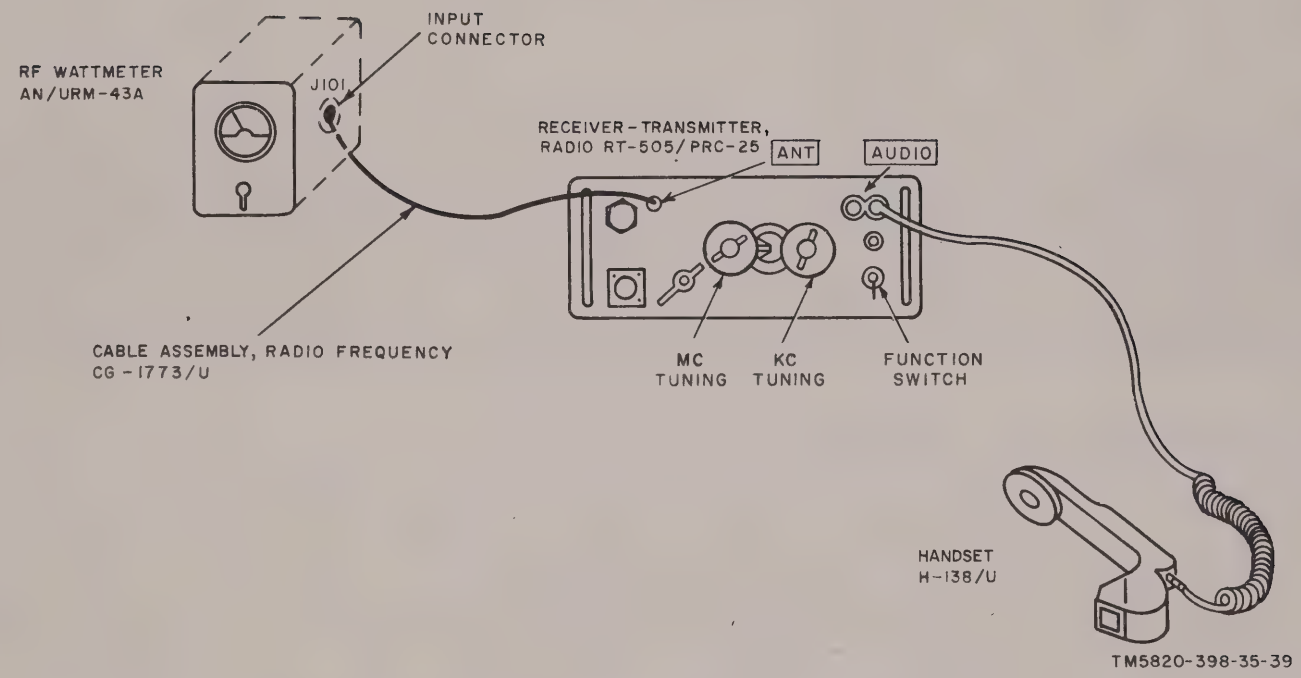


Figure 42. Transmitter power output test setup.

56. Transmitter Power Output Test

a. Test Equipment and Materials.

(1) RF Wattmeter AN/URM-43A.

(2) Handset H-138/U.

(3) Cable Assembly, Radio Frequency CG-1773/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 42. Turn on the equipment and allow it to warm up for 1 minute.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*AN/URM-43A* 15W-60W switch: 15W.	BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 30. REC-TRANS FREQUENCY (kc) control: 00. VOLUME control: 0. FUNCTION switch: ON.	*a.* Press the H-138/U push-to-talk switch and note the AN/URM-43A meter indication. Release the H-138/U push-to-talk switch. *b.* Repeat step *a* above with the RT-505/PRC-25 REC-TRANS FREQUENCY controls set to frequencies of 42.00 mcs and 52.95 mcs.	*a.* The AN/URM-43A meter indicates at least 2 watts. *b.* Same as *a* above.
2	Same as step 1 above.	BAND switch: 53-75. REC-TRANS FREQUENCY (mc) control: 53. REC-TRANS FREQUENCY (kc) control: 00. VOLUME control: 0. Function switch: ON.	*a.* Press the H-138/U push-to-talk switch and note the AN/URM-43A meter indication. Release the H-138/U push-to-talk switch. *b.* Repeat step *a* above with the RT-505/PRC-25 REC-TRANS FREQUENCY controls set to frequencies of 65.00 mcs and 75.95 mcs.	*a.* The AN/URM-43A meter indicates at least 1.5 watts. *b.* Same as *a* above.

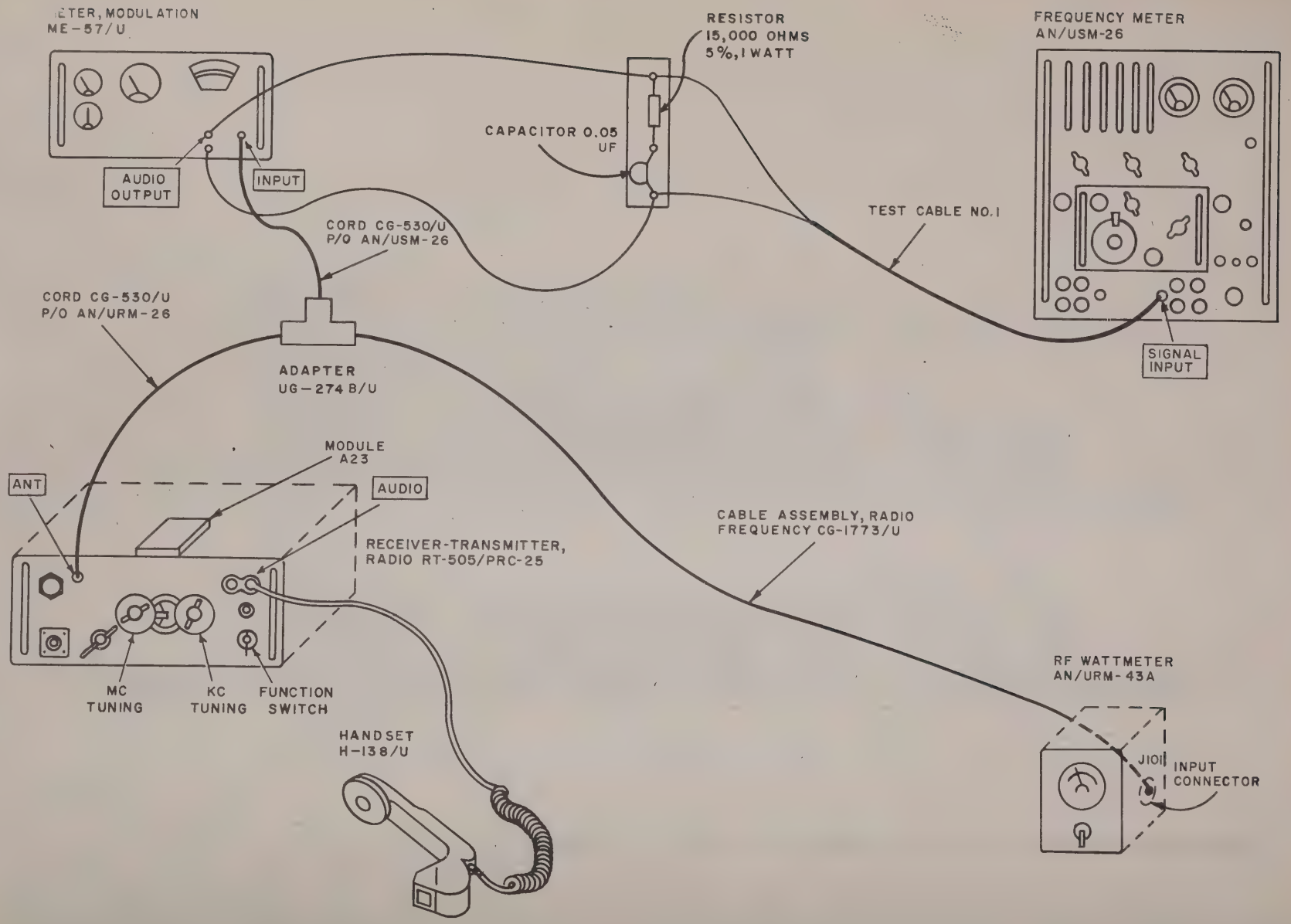


Figure 43. Tone oscillator frequency and transmitter modulation test setup.

57. Tone Oscillator Frequency and Transmitter Modulation Test

a. Test Equipment and Materials.

(1) RF Wattmeter AN/URM-43A.
(2) Meter, Modulation ME-57/U.
(3) Frequency Meter AN/USM-26.
(4) Handset H-138/U.
(5) Adapter UG-274B/U.
(6) Resistor, 15,000 ohms, 5 percent, 1 watt.
(7) Capacitor, 0.05 uf.
(8) Cable Assembly, Radio Frequency CG-1773/U.
(9) Test Cable No. 1.

b. Test Conditions and Connections. Connect equipment as shown in figure 43. Turn on equipment and allow it to warm up for 30 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*AN/URM-43A* 15W-60W switch: 15W. *AN/USM-26* FUNCTION SELECTOR switch: FREQUENCY. FREQUENCY UNIT switch: 1. DISPLAY TIME control: fully counterclockwise. MIXING FREQUENCY MCS control: 0. GAIN control: MIN. *ME-57/U* TUNE-FINE TUNE switch: TUNE. DEVIATION RANGE KC switch: 1000 TUNE. FREQUENCY RANGE-MC switch: 20-55. FREQUENCY RANGE-MC TUNING control: 41.	BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 5.	*a.* Remove module A23 ---------- *b.* Press and hold the H-138/U push-to-talk switch *c.* Adjust the ME-57/U TUNING control until the CARRIER SHIFT meter reads zero. *d.* Set the ME-57/U TUNE-FINE TUNE switch to the FINE TUNE position. *e.* Adjust the ME-57/U TUNING control until the CARRIER SHIFT meter again reads zero. *f.* Adjust the RT-505/PRC-25 VOLUME control until the ME-57/U LIMITING meter reads in the black area. *g.* Release the H-138/U push-to-talk switch ------ *h.* Replace module A23 ----------	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* None. *h.* None.
2	Same as step No. 1.	Same as step No. 1.	*a.* Press and hold the H-138/U push-to-talk switch *b.* Turn the ME-57/U DEVIATION RANGE KC switch to obtain the highest reading on the DEVIATION meter without pegging the meter. *Note:* When the 1000 TUNE position is used, multiply the 0-100 scale reading on the DEVIATION meter by 10. *c.* Adjust the AN/USM-26 GAIN control until the shadow in the tuning eye just closes. *d.* Release the H-138/U push-to-talk switch ------	*a.* None. *b.* Deviation should be 3.0 ±0.5 kc. *c.* Frequency should be 150 ±1.5 cps. *d.* None.

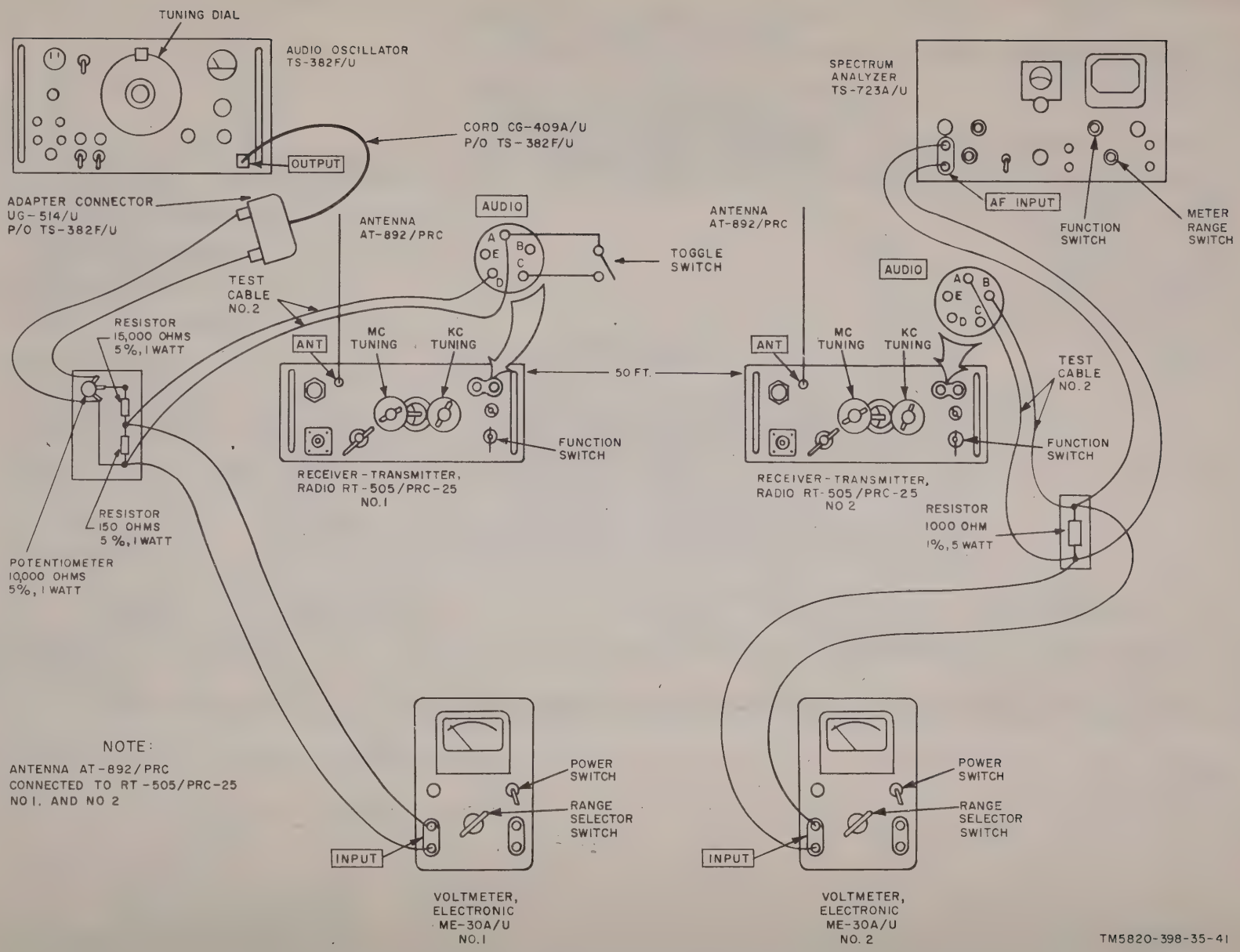


Figure 44. System distortion test setup.

	Tuning dial: 100. OUTPUT MULTIPLIER switch: X1 volts. OUTPUT CONTROL: fully counterclockwise. *RT-505/PRC-25 No. 1* Function switch: ON. BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. VOLUME control: 0.			
2	Same as in step No. 1, except: *TS-723A/U* Frequency RANGE switch: X10. FREQUENCY controls: dial indication of 100. Signal INPUT control: MIN. AF-RF selector switch: AF. Function switch: SET LEVEL. Meter range switch: 100%.	Same as in step No. 1.	Adjust the TS-723A/U as follows: *a.* Slowly turn the signal INPUT control clockwise until the TS-723A/U meter pointer reaches full scale deflection. *b.* Turn the function switch to DISTORTION. *c.* Adjust the coarse FREQUENCY control knob (upper) until the TS-723A/U meter pointer drops sharply. *d.* Adjust the fine FREQUENCY control knob (lower) for maximum dip of the meter pointer. *Note:* The tuning becomes more critical as the meter reading decreases. *e.* Adjust the BALANCE control for a minimum meter reading. *Note:* The tuning becomes more critical as the meter reading decreases. *f.* Readjust the FREQUENCY and BALANCE controls until no further reduction in the meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a midscale meter indication. *g.* Note the TS-723/U meter reading.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* TS-723A/U meter indicates distortion of 10 percent or less.

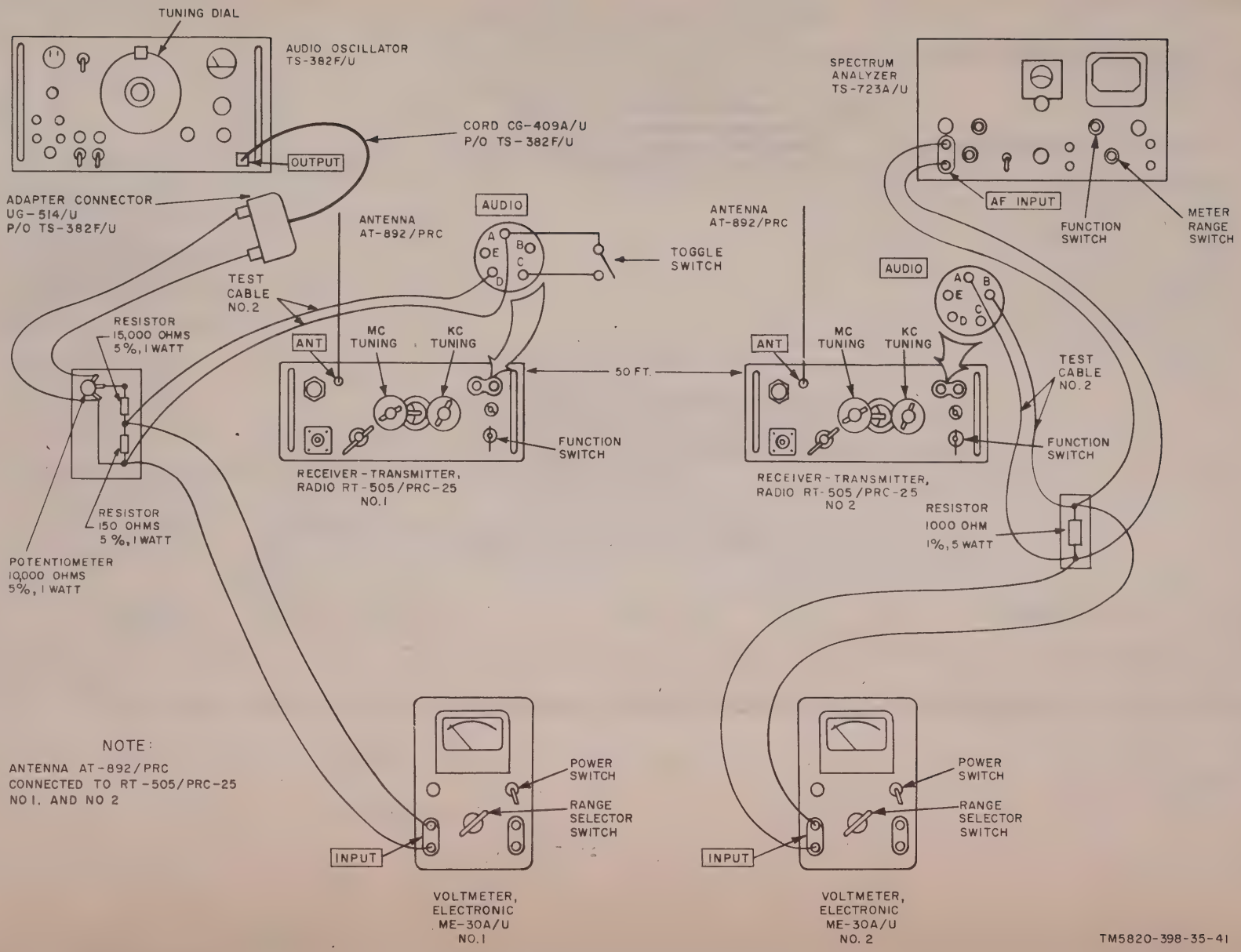


Figure 44. System distortion test setup.

58. System Distortion Test

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U (two required).
(2) Audio Oscillator TS-382F/U.
(3) Spectrum Analyzer TS-723A/U.
(4) Radio Set AN/PRC-25.
(5) Potentiometer, 10,000 ohms, ±5 percent, 1 watt.
(6) Resistor, 15,000 ohms, ±5 percent, 1 watt.
(7) Resistor, 150 ohms, ±5 percent, 1 watt.
(8) Resistor, 1,000 ohms, ±1 percent, 5 watts.
(9) Toggle switch, signal pole, single throw.
(10) Test cable No. 2 (four required).

b. Test Conditions and Connections. Two men are required to perform this test. Connect the equipment as shown in figure 44 and install Antenna AT-892/PRC in the RT-505/PRC-25's for the test. Turn on equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedures	Performance standard
1	*ME-30A/U No. 1* Power switch: ON. Range selector switch: .003 VOLTS, -50 DB. *ME-30A/U No. 2* Power switch: ON. Range Selector switch: 3 VOLTS, +10 DB. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1 volts. OUTPUT CONTROL: fully counterclockwise. *RT-505/PRC-25 No. 1* Function switch: ON. BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. VOLUME control: 0.	*RT-505/PRC-25 No. 2* BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 5.	*a.* Set the TS-382F/U OUTPUT CONTROL to its maximum clockwise position. Adjust the 10,000-ohm potentiometer until ME-30A/U No. 1 indicates 1.4 millivolts (mv). *b.* Close the toggle switch on RT-505/PRC-25 No. 1. *c.* Adjust RT-505/PRC-25 No. 2 VOLUME control until ME-30A/U No. 2 indicates 1 volt.	*a.* None. *b.* None. *c.* None.
2	Same as in step No. 1, except: *TS-723A/U* Frequency RANGE switch: X10. FREQUENCY controls: dial indication of 100. Signal INPUT control: MIN. AF-RF selector switch: AF. Function switch: SET LEVEL. Meter range switch: 100%.	Same as in step No. 1.	Adjust the TS-723A/U as follows: *a.* Slowly turn the signal INPUT control clockwise until the TS-723A/U meter pointer reaches full scale deflection. *b.* Turn the function switch to DISTORTION. *c.* Adjust the coarse FREQUENCY control knob (upper) until the TS-723A/U meter pointer drops sharply. *d.* Adjust the fine FREQUENCY control knob (lower) for maximum dip of the meter pointer. *Note:* The tuning becomes more critical as the meter reading decreases. *e.* Adjust the BALANCE control for a minimum meter reading. *Note:* The tuning becomes more critical as the meter reading decreases. *f.* Readjust the FREQUENCY and BALANCE controls until no further reduction in the meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a midscale meter indication. *g.* Note the TS-723/U meter reading.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* TS-723A/U meter indicates distortion of 10 percent or less.

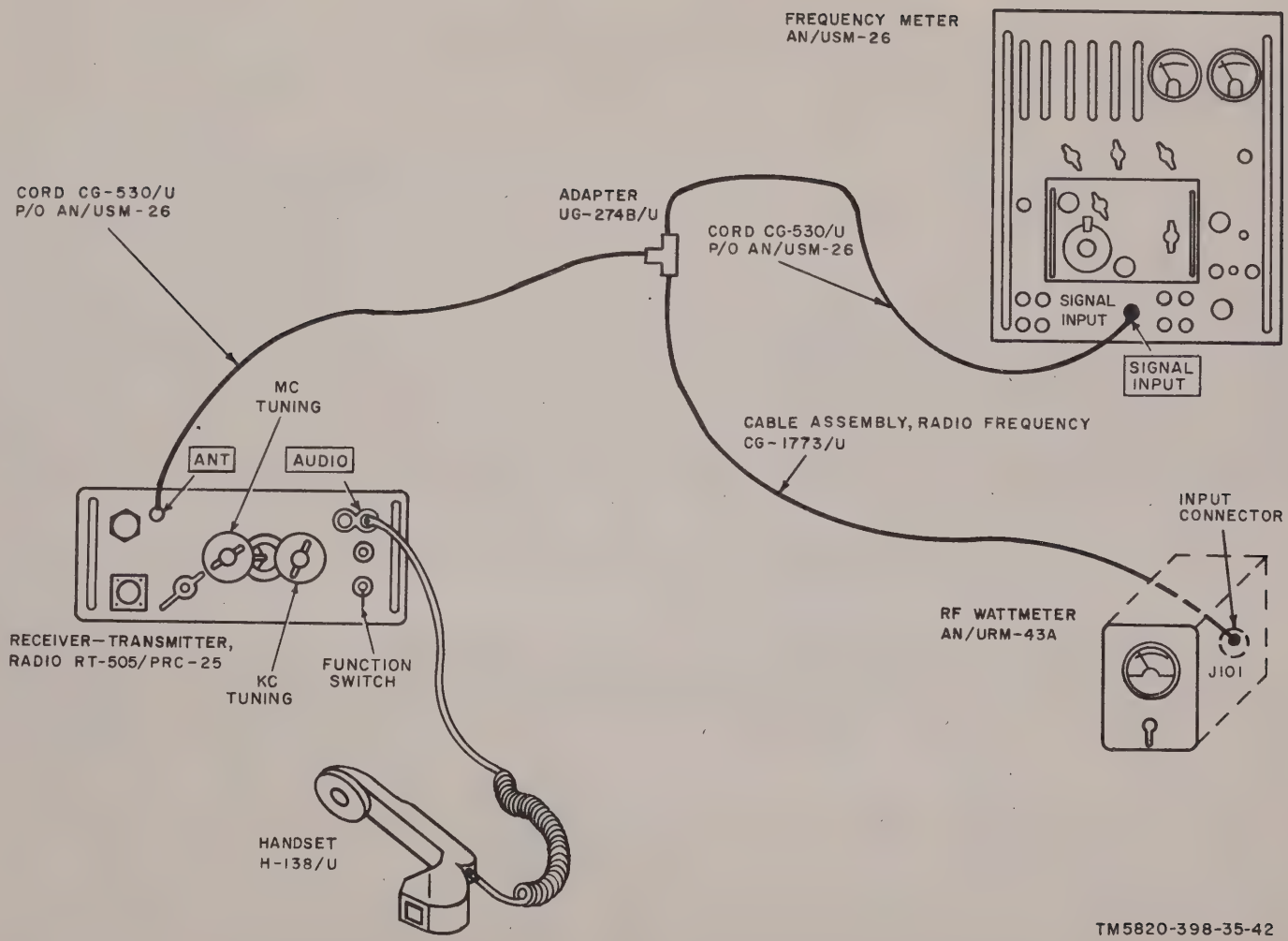


Figure 45. Frequency accuracy test setup.

		FREQUENCY (kc) control: 70.		
10	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 80.	Same as step No. 1 above ----------	75.80 mc ±3.5 kc.
11	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 90.	Same as step No. 1 above ----------	75.90 mc ±3.5 kc.
12	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 95.	Same as step No. 1 above ----------	75.95 mc ±3.5 kc.
13	Same as step No. 1, except: *AN/USM-26:* MIXING FREQUENCY MCS switch: 50. TUNING control: 20.	Same as step No. 1, except: BAND switch: 30-52. REC-TRANS FREQUENCY(mc) control: 52. REC-TRANS FREQUENCY (kc) control: 00.	Same as step No. 1 above ----------	52.00 mc ±3.5 kc.

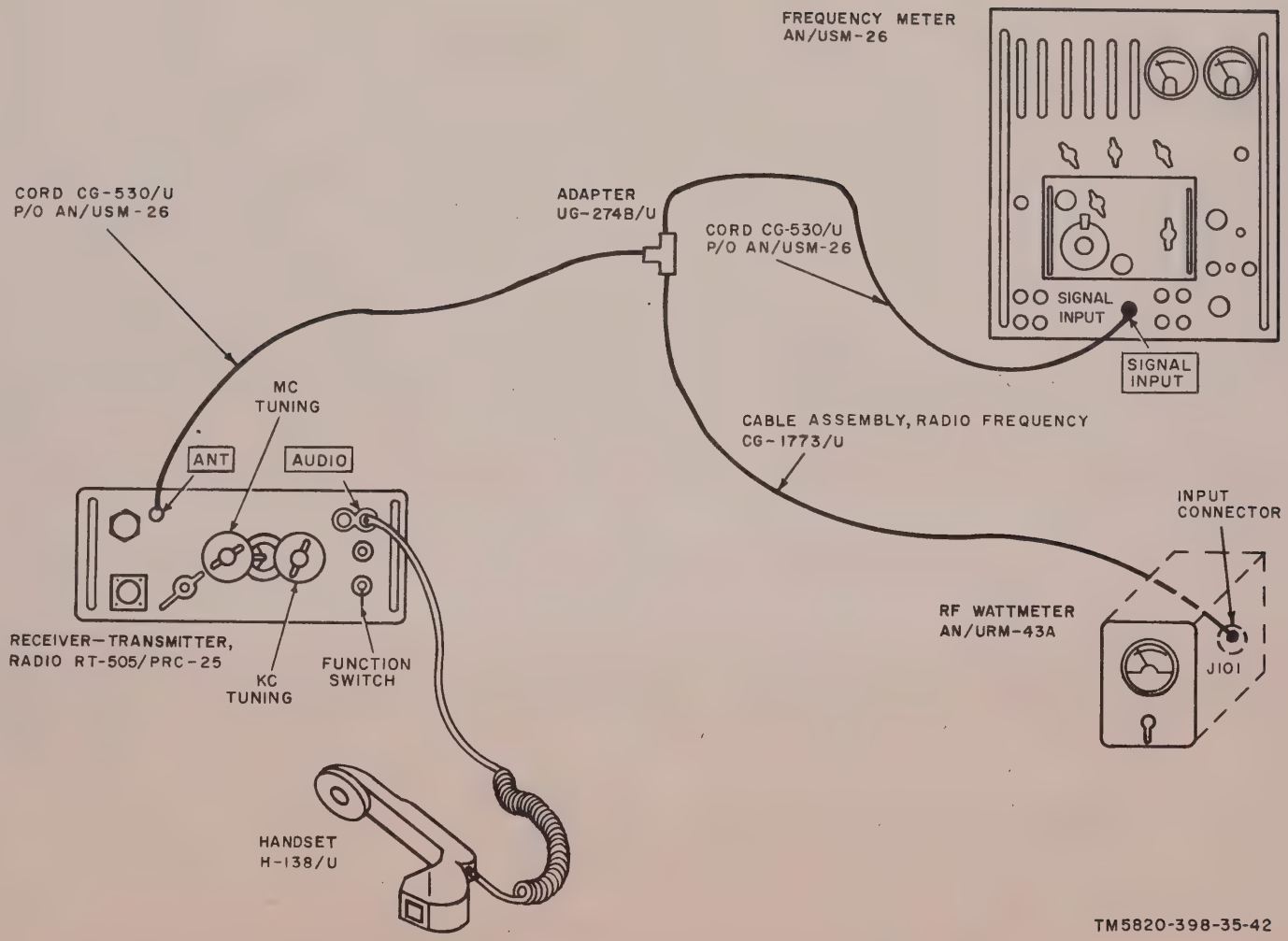


Figure 45. Frequency accuracy test setup.

59. Frequency Accuracy Test

a. Test Equipment and Materials.

(1) RF Wattmeter AN/URM-43A.
(2) Frequency Meter AN/USM-26.
(3) Adapter UG-274B/U.
(4) Handset H-138/U.
(5) Cable CG-530/U.
(6) Cable Assembly, Radio Frequency CG-1773/U.

b. Test Conditions and Connections. Connect the equipment as shown in figure 45. Turn on the equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedures	Performance standard
1	*AN/USM-26* FUNCTION SELECTOR switch: FREQUENCY. FREQUENCY UNIT switch: 1. DISPLAY TIME control: fully counterclockwise. RANGE-MC switch: 40-100. MIXING FREQUENCY MCS switch: 70. TUNING control: 70. GAIN control: MAX. *AN/URM-43A* 15W-60W switch: 15W.	BAND switch: 53-75. REC-TRANS FREQUENCY (mc) control: 75. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 5.	*a.* Press the H-138/U push-to-talk switch ------ *b.* Adjust the AN/USM-26 TUNING control until minimum shadow is obtained on the tuning eye. If the shadow overlaps, reduce the GAIN control setting and retune the TUNING control. *c.* Adjust the GAIN control until the shadow of the tuning eye just closes, but does not overlap. *d.* Compute the frequency by adding the reading of MIXING FREQUENCY MCS switch (frequency in megacycles) to the reading on the display system (frequency in kilocycles). *e.* Release the H-138/U push-to-talk switch -----	*a.* None. *b.* None. *c.* None. *d.* 75.00 mc ±3.5 kc. *e.* None.
2	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 05.	Same as step No. 1 above ----------	75.05 mc ±3.5 kc.
3	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 10.	Same as step No. 1 above ----------	75.10 mc ±3.5 mc.
4	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 20.	Same as step No. 1 above ----------	75.20 mc ±3.5 kc
5	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 30.	Same as step No. 1 above ----------	75.30 mc ±3.5 kc.
6	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 40.	Same as step No. 1 above ----------	75.40 mc ±3.5 kc.
7	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 50.	Same as step No. 1 above ----------	75.50 mc ±3.5 kc.
8	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 60.	Same as step No. 1 above ----------	75.60 mc ±3.5 kc.
9	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 70.	Same as step No. 1 above ----------	75.70 mc ±3.5 kc.
10	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 80.	Same as step No. 1 above ----------	75.80 mc ±3.5 kc.
11	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 90.	Same as step No. 1 above ----------	75.90 mc ±3.5 kc.
12	Same as step No. 1.	Same as step No. 1, except: REC-TRANS FREQUENCY (kc) control: 95.	Same as step No. 1 above ----------	75.95 mc ±3.5 kc.
13	Same as step No. 1, except: *AN/USM-26:* MIXING FREQUENCY MCS switch: 50. TUNING control: 20.	Same as step No. 1, except: BAND switch: 30-52. REC-TRANS FREQUENCY(mc) control: 52. REC-TRANS FREQUENCY (kc) control: 00.	Same as step No. 1 above ----------	52.00 mc ±3.5 kc.

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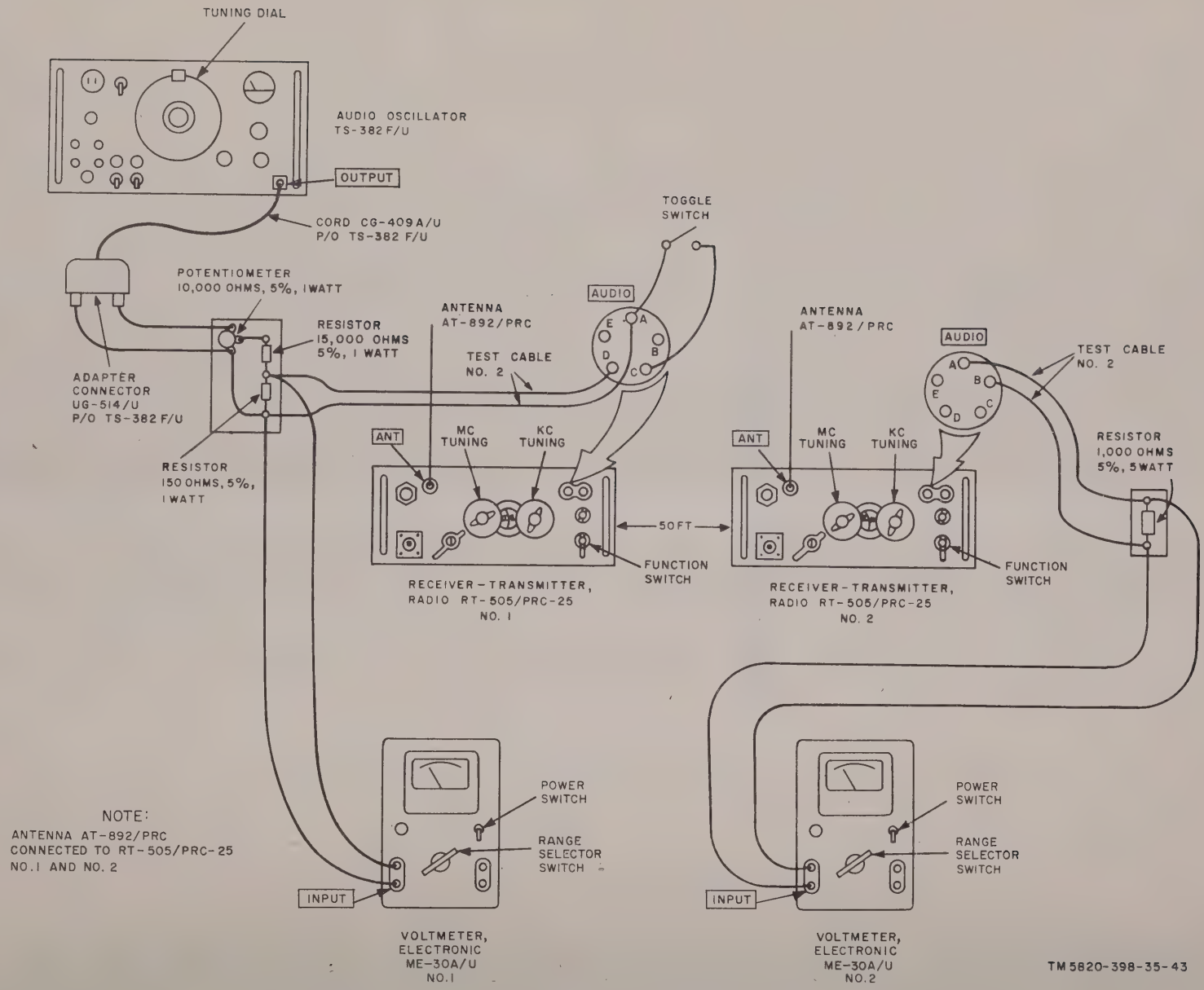

Figure 46. Maximum signal plus noise-to-noise ratio test setup.

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U.
(2) Audio Oscillator TS-382F/U.
(3) Radio Set AN/PRC-25.
(4) Potentiometer, 10,000 ohms, ±5 percent, 1 watt.
(5) Resistor, 15,000 ohms, ±5 percent, 1 watt.
(6) Resistor, 150 ohms, ±5 percent, 1 watt.
(7) Resistor, 1,000 ohms, ±1 percent, 5 watts.
(8) Toggle switch.
(9) Test cable No. 2 (four required).

b. Test Conditions and Connections. Two men are required to perform this test. Connect equipment as shown in figure 46 and install Antenna AT-892/PRC in the RT-505/PRC-25's for all tests. Turn on equipment and allow it to warmup for 1 minute.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1 VOLTS. OUTPUT CONTROL: fully counterclockwise. *ME-30A/U No. 1* Power switch: ON. Range selector switch: .003 VOLTS, -50 DB. *ME-30A/U No. 2* Range selector switch: 10 VOLTS, +20 DB. *RT-505/PRC-25 No. 1* BAND switch: 30-52 mc. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 00.	*RT-505/PRC-25 No.2* BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 5.	*a.* Set the TS-382F/U OUTPUT CONTROL at its maximum clockwise position. Adjust the 10K potentiometer until ME-30A/U No. 1 indicates 1.4 millivolts (mv). *b.* Note and record ME-30A/U No. 2 meter indication.	*a.* None. *b.* None.
2	Same as in step No. 1, except: *ME-30A/U No. 2* Range selector switch: 100 VOLTS, +50 DB.	Same as step No. 1 above.	*a.* Close the toggle switch. *b.* Note and record ME-30A/U No. 2 meter indication. *c.* Open the toggle switch.	*a.* None. *b.* Indication should be at least 40 db greater than that of step 1*b*. *c.* None.

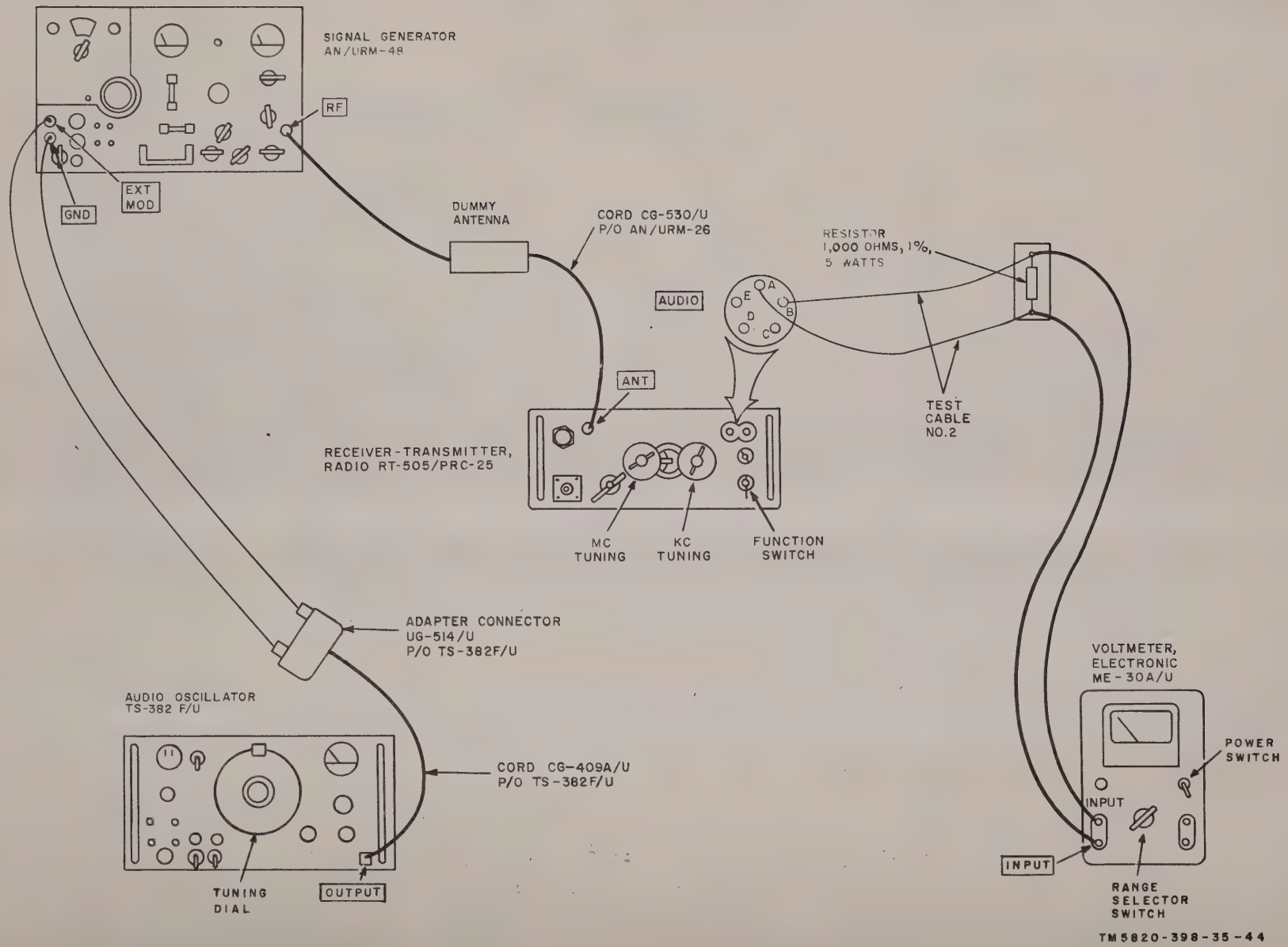

Figure 47. Receiver audio output power test setup.

61. Receiver Audio Output Power Test

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U.
(2) Signal Generator AN/URM-48.
(3) Audio Oscillator TS-382F/U.
(4) Dummy antenna.
(5) Resistor 1,000 ohms, ±1 percent, 5 watts.
(6) Cord CG-530/U.
(7) Test Cable No. 2 (two required).

b. Test Connections and Conditions. Connect the equipment as shown in figure 47. Turn on equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *AN/URM-48* BAND SWITCH: C. RF TUNING control: 41. DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: 10 on KILOCYCLES DEVIATION meter. RF SET TO LINE control: right-hand meter needle to redline. RF ATTENUATOR MICROVOLTS control: 400 microvolts on right-hand meter. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully counterclockwise.	BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 10.	Note the ME-30A/U meter indication.	The ME-30A/U should indicate at least 2 volts.

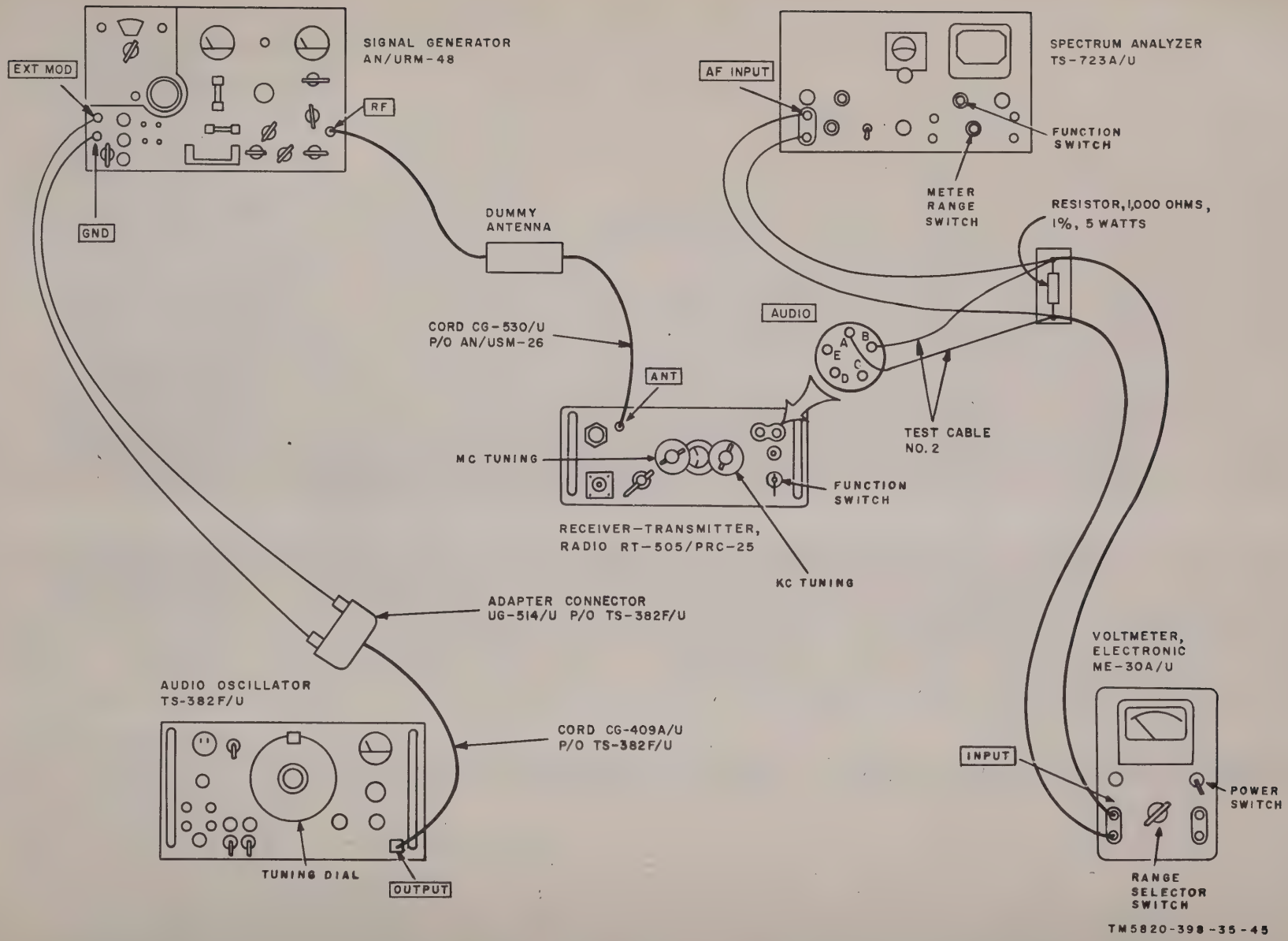

Figure 48. Receiver sensitivity test setup.

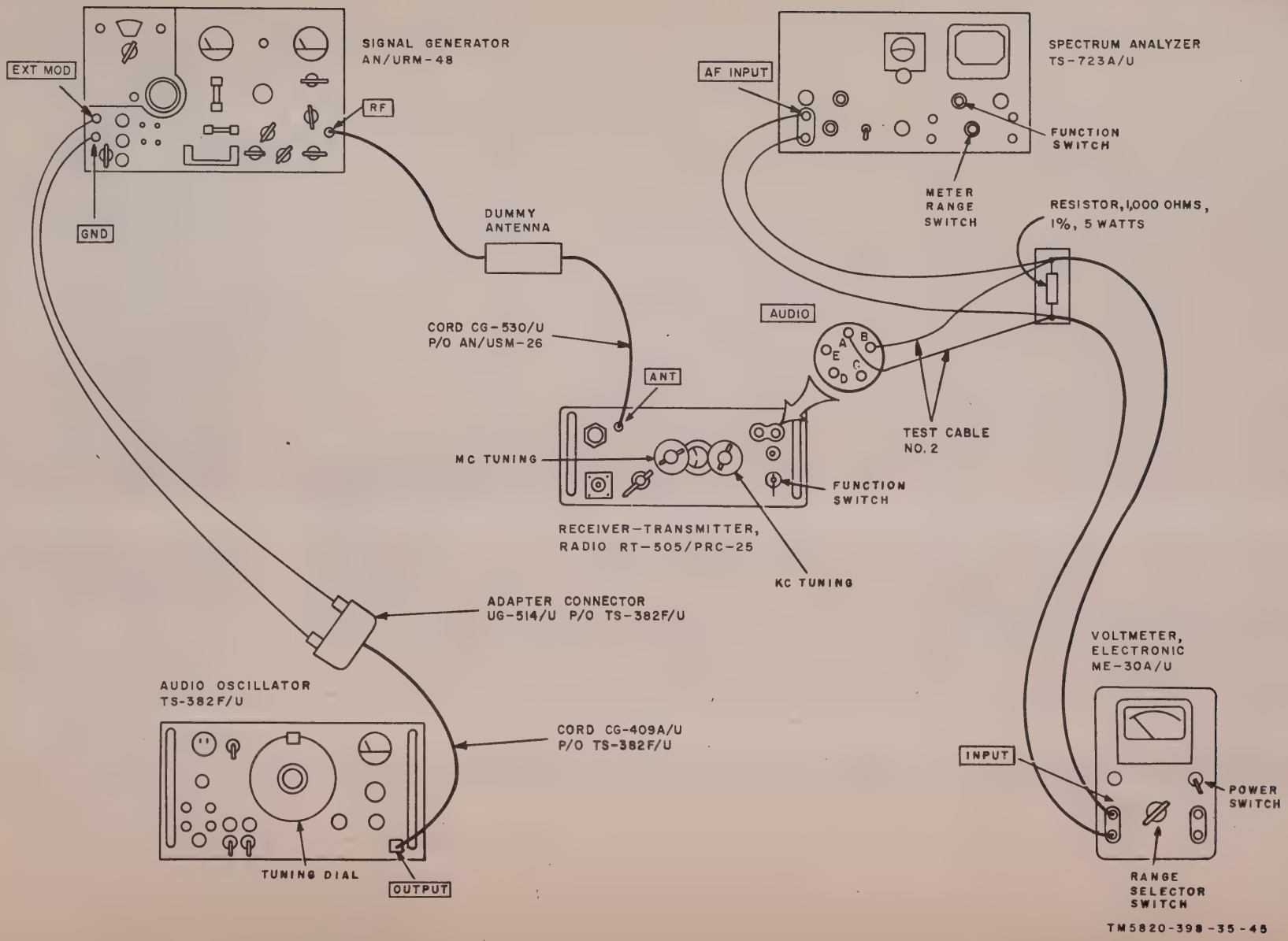

Figure 48. Receiver sensitivity test setup.

62. Receiver Sensitivity Test

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U.
(2) Signal Generator AN/URM-48.
(3) Spectrum Analyzer TS-723A/U.
(4) Audio Oscillator TS-382F/U.
(5) Dummy antenna.
(6) Resistor 1,000 ohms, ±1 percent, 5 watt.
(7) Test cable No. 2 (two required).

b. Test Connections and Conditions. Connect the equipment as shown in figure 48. Turn on the equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *AN/URM-48* BAND SWITCH: B. RF TUNING control: DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: Set for 10 on KILOCYCLES DEVIATION meter. RF SET TO LINE control: Set right-hand meter needle to redline. RF ATTENUATOR MICROVOLTS control: 0.70 microvolt on right-hand meter. *TS-723A/U* Frequency RANGE switch: X10. Signal INPUT control: MIN. FREQUENCY controls: indication of 100 on dial. Function switch: METER. Meter range switch: 100%. AF-RF selector switch: AF. Meter range switch: RMS VOLTS. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully clockwise.	BAND switch: 30-52 MC. REC-TRANS FREQUENCY (mc) control: 30. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 5.	*a.* Adjust the AN/URM-48 RF TUNING control for a peak indication on the ME-30A/U. *b.* Adjust the RT-505/PRC-25 VOLUME control for a 1-volt indication on the ME-30A/U. *c.* Turn the TS-723A/U function switch to SET LEVEL. *d.* Slowly rotate the TS-723A/U signal INPUT control clockwise until the TS-723A/U meter pointer reaches full scale deflection (1.0). *e.* Set the TS-723A/U meter range switch to +10 db. *f.* Slowly rotate the TS-723A/U signal INPUT control until the TS-723A/U meter pointer rests at 0 DECIBELS. *g.* Turn the TS-723A/U function switch to DISTORTION. *h.* Adjust the TS-723A/U coarse FREQUENCY control until the TS-723A/U meter pointer dips sharply. *i.* Adjust the TS-723A/U fine FREQUENCY control for the maximum dip of the TS-723A/U meter pointer. *j.* Adjust the TS-723A/U BALANCE control for the minimum TS-723A/U meter reading. *k.* Readjust the TS-723A/U FREQUENCY and BALANCE controls until no further reduction in the TS-723A/U meter indication can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain midscale meter deflections. *l.* Record the TS-723A/U meter indication; then turn the TS-723A/U function switch to SET LEVEL and record the TS-723A/U meter indication.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* None. *h.* None. *i.* None. *j.* None. *k.* None. *l.* TS-723A/U meter indication obtained in DISTORTION position should be at least 10 db lower than the meter indication obtained in the SET LEVEL position.
2	Same as step No. 1, except: *AN/URM-48* BAND SWITCH: C. RF TUNING control: 41.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00.	Repeat step 1 above	Same as step 1 above.
3	Same as step No. 1, except: *AN/URM-48* BAND SWITCH: D. RF TUNING control: 52.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 52. REC-TRANS FREQUENCY (kc) control: 00.	Repeat step 1 above	Same as step 1 above.
4	Same as step No. 1, except: *AN/URM-48* BAND SWITCH: D. RF TUNING control: 53.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 53. REC-TRANS FREQUENCY (kc) control: 00. BAND switch: 53-75.	Repeat step 1 above	Same as step 1 above.
5	Same as step No. 1, except: *AN/URM-48* BAND SWITCH: D. RF TUNING control: 65.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 65. REC-TRANS FREQUENCY (kc) control: 00. BAND SWITCH: 53-75.	Repeat step 1 above	Same as step 1 above.
6	Same as step No. 1, except: *AN/URM-48* BAND SWITCH: E. RF TUNING control: 75.95.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 75. REC-TRANS FREQUENCY (kc) control: 95. BAND switch: 53-75.	Repeat step 1 above	Same as step 1 above.

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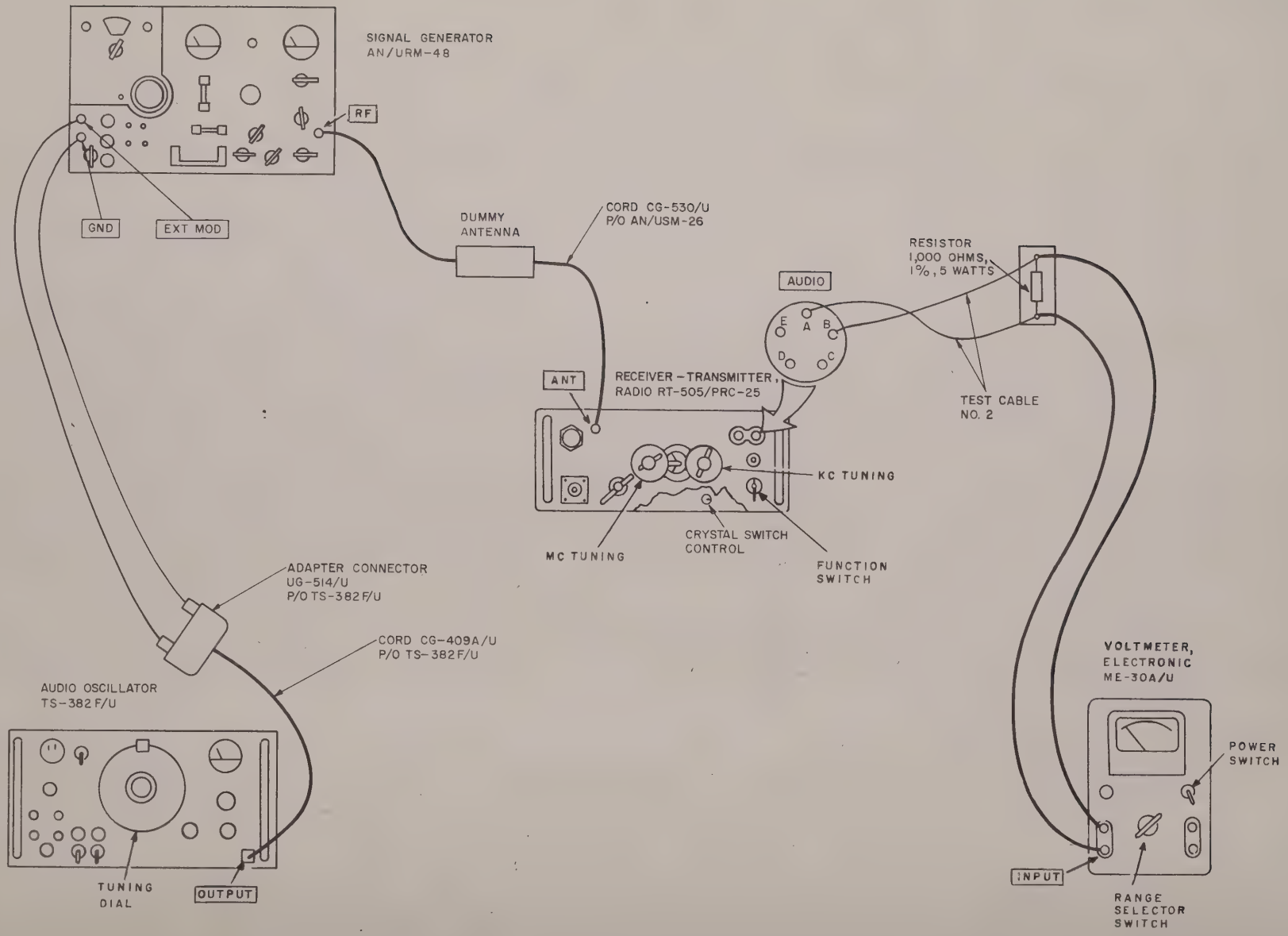

Figure 49. Receiver catching range test setup.

	Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *AN/URM-48* BAND SWITCH: B. RF TUNING control: 31.5. DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: set for 10 on KILOCYCLE DEVIATION meter. RF SET TO LINE control: redline on right-hand meter. RF ATTENUATOR MICROVOLTS control: 40 microvolts on right-hand meter. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully counterclockwise.	REC-TRANS FREQUENCY (mc) control: 31.	1-volt indication on the ME-30A/U. *a.* Disable the RT-505/PRC-25 crystal switch assembly by disengaging the mechanical coupling (A10). *b.* Rotate the RT-505/PRC-25 REC-TRANS FREQUENCY (kc) control higher in frequency in 50-kc increment. *c.* Turn the RT-505/PRC-25 function switch momentarily from ON to OFF, then back to ON after each change of frequency. *d.* Record the highest RT-505/PRC-25 frequency at which an indication is obtained on the ME-30A/U. *e.* Rotate the RT-505/PRC-25 REC-TRANS FREQUENCY (kc) control lower in frequency in 50-kc increments. *f.* Turn the RT-505/PRC-25 function switch momentarily from ON to OFF, then back to ON after each change of frequency. *g.* Record the lowest RT-505/PRC-25 frequency at which an indication is obtained on the ME-30A/U. *h.* Engage the crystal switch by turning the RT-505/PRC-25 REC-TRANS FREQUENCY control. (Mechanical coupling is self-engaging.)	*a.* None. *b.* None. *c.* None. *d.* Frequency should be at least 300 kc higher than 31.50 mcs. *e.* None. *f.* None. *g.* Difference between the upper and lower frequency indications should be at least 600 kc. *h.* None.
2	Same as step No. 1, except: *AN/USM-48* BAND SWITCH: D. RF TUNING control: 51.5.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 51. REC-TRANS FREQUENCY (kc) control: 50.	Repeat step 1 above ----------	Frequency indication for 51.50 mc should be the same as indicated for 31.50 mc in 1*d* and *g* above.

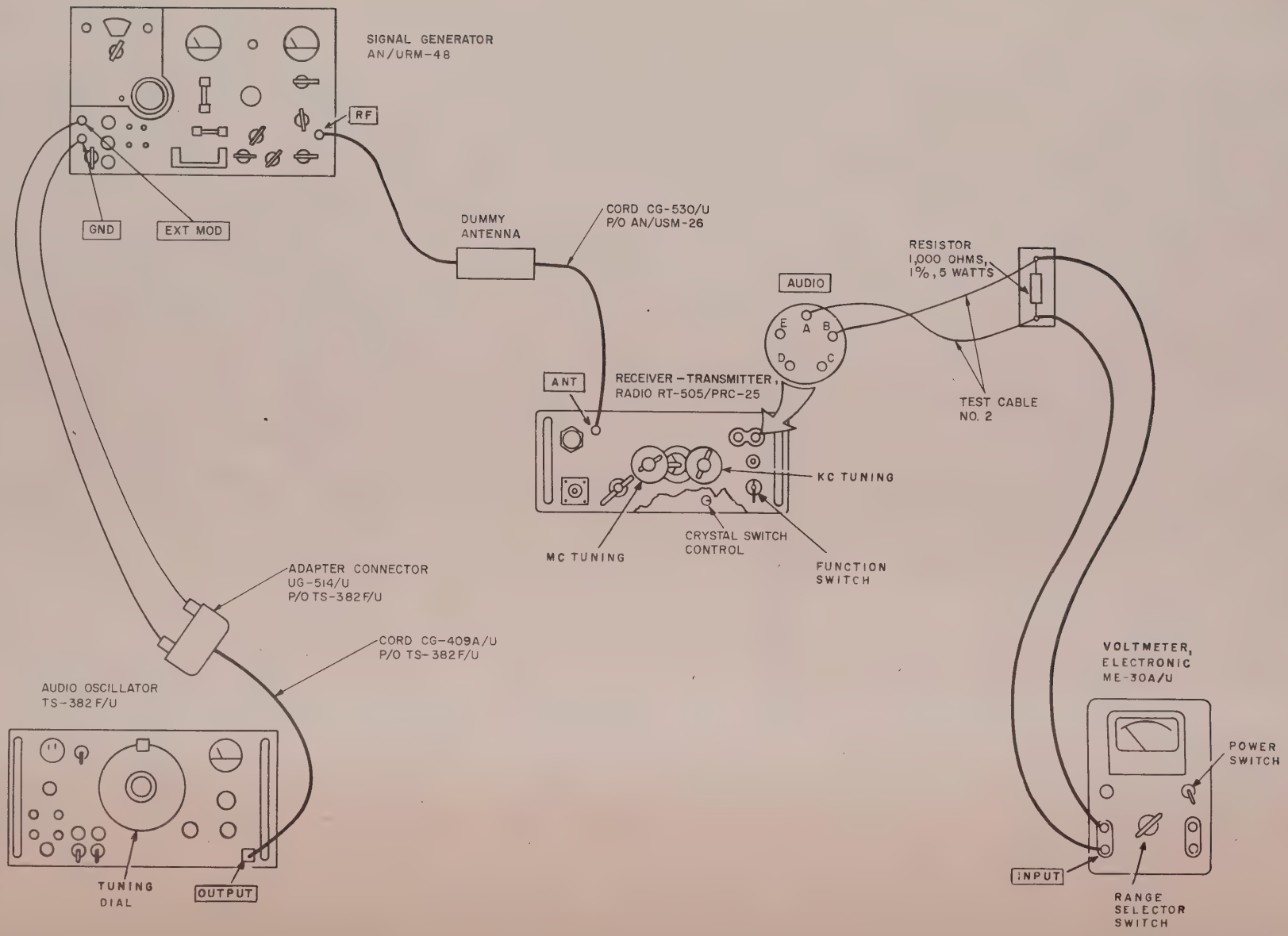

Figure 49. Receiver catching range test setup.

63. Receiver Catching Range Test

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U.
(2) Signal Generator AN/URM-48.
(3) Audio Oscillator, TS-382F/U.
(4) Dummy antenna.
(5) Resistor 1,000 ohms, ±1 percent, 5 watts.
(6) Cord CG-530/U.
(7) Test cable No. 2 (two required).

b. Test Connections and Conditions. Connect the test equipment as shown in figure 49. Turn on equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *AN/URM-48* BAND SWITCH: B. RF TUNING control: 31.5. DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: set for 10 on KILOCYCLE DEVIATION meter. RF SET TO LINE control: redline on right-hand meter. RF ATTENUATOR MICROVOLTS control: 40 microvolts on right-hand meter. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully counterclockwise.	BAND: 30-52. REC-TRANS FREQUENCY (mc) control: 31.	Adjust the RT-505/PRC-25 VOLUME control for a 1-volt indication on the ME-30A/U. *a.* Disable the RT-505/PRC-25 crystal switch assembly by disengaging the mechanical coupling (A10). *b.* Rotate the RT-505/PRC-25 REC-TRANS FREQUENCY (kc) control higher in frequency in 50-kc increment. *c.* Turn the RT-505/PRC-25 function switch momentarily from ON to OFF, then back to ON after each change of frequency. *d.* Record the highest RT-505/PRC-25 frequency at which an indication is obtained on the ME-30A/U. *e.* Rotate the RT-505/PRC-25 REC-TRANS FREQUENCY (kc) control lower in frequency in 50-kc increments. *f.* Turn the RT-505/PRC-25 function switch momentarily from ON to OFF, then back to ON after each change of frequency. *g.* Record the lowest RT-505/PRC-25 frequency at which an indication is obtained on the ME-30A/U. *h.* Engage the crystal switch by turning the RT-505/PRC-25 REC-TRANS FREQUENCY control. (Mechanical coupling is self-engaging.)	*a.* None. *b.* None. *c.* None. *d.* Frequency should be at least 300 kc higher than 31.50 mcs. *e.* None. *f.* None. *g.* Difference between the upper and lower frequency indications should be at least 600 kc. *h.* None.
2	Same as step No. 1, except: *AN/USM-48* BAND SWITCH: D. RF TUNING control: 51.5.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 51. REC-TRANS FREQUENCY (kc) control: 50.	Repeat step 1 above ----------	Frequency indication for 51.50 mc should be the same as indicated for 31.50 mc in 1*d* and *g* above.

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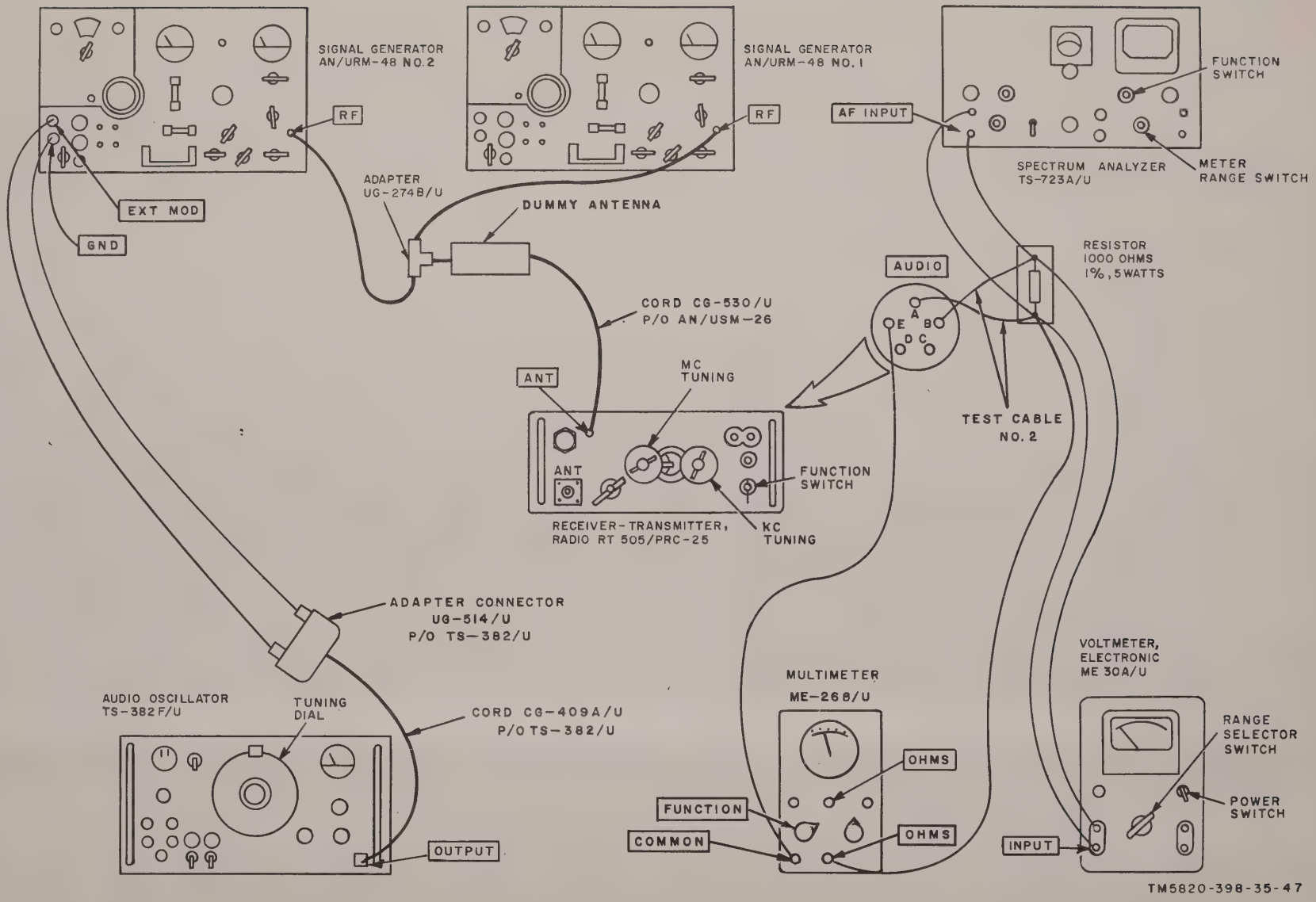

Figure 50. Squelch sensitivity test setup.

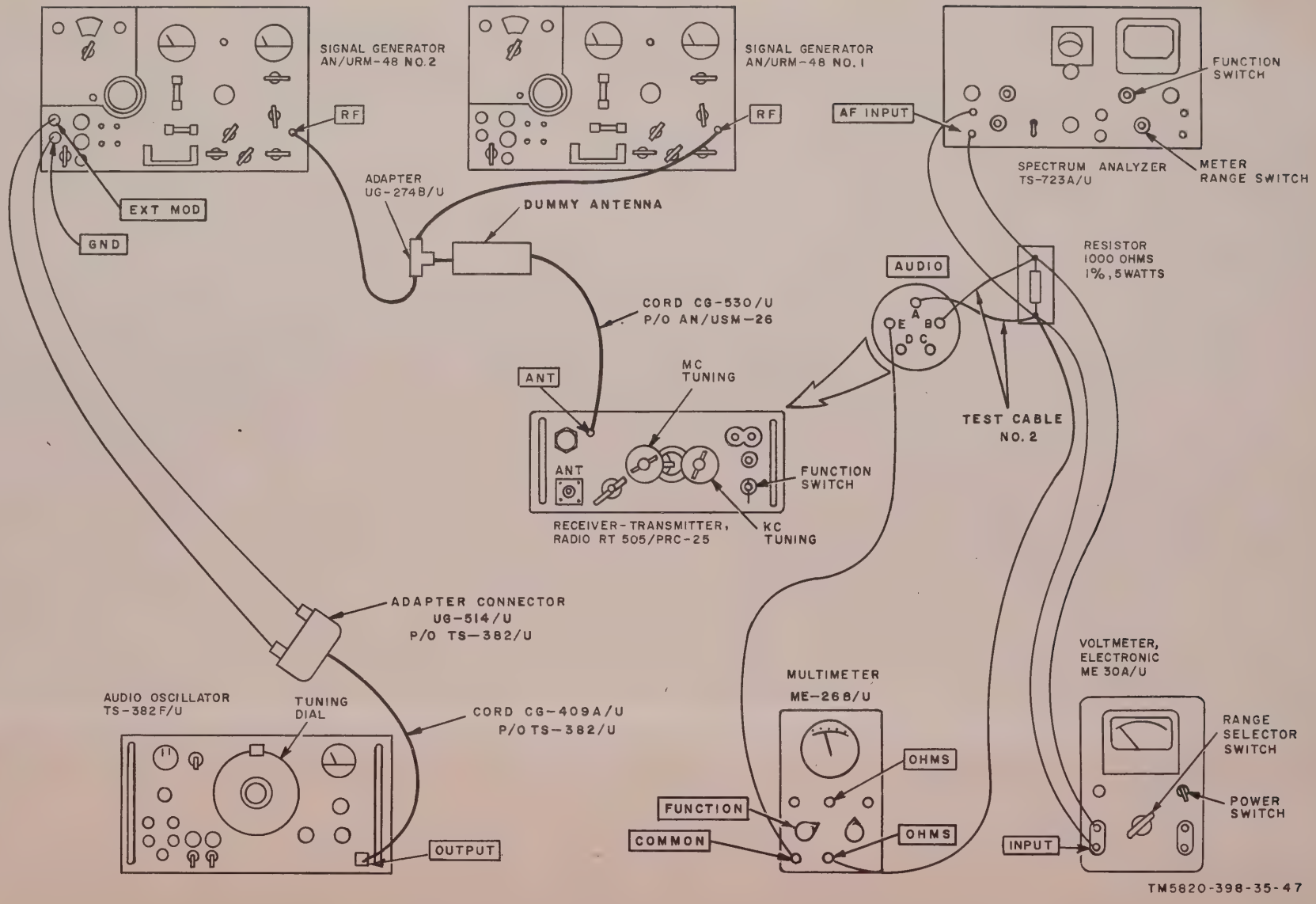

Figure 50. Squelch sensitivity test setup.

64. Squelch Sensitivity Test

a. Test Equipment and Materials.

(1) Voltmeter, Meter ME-30A/U.
(2) Signal Generator AN/URM-48 (2 required).
(3) Audio Oscillator TS-382F/U.
(4) Spectrum Analyzer TS-723A/U.
(5) Multimeter ME-26B/U.
(6) Dummy antenna.
(7) Resistor 1,000 ohms, ±1 percent, 5 watts.
(8) Adapter UG-274B/U.
(9) Cord CG-530/U.
(10) Test cable No. 2 (2 required).

b. Test Connections and Conditions. Connect the equipment as shown in figure 50. Turn on the equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *TS-382F/U* FREQUENCY MULTIPLIER switch: X1. Tuning dial: 150. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully clockwise. *TS-723A/U* Signal INPUT control: MIN. AF-RF selector switch: RF. Frequency RANGE switch: 10. FREQUENCY tuning dials: 100. Function switch: DISTORTION. Meter range switch: 100%. *AN/URM-48 No. 1* BAND SWITCH: B. RF TUNING control: 30 mc. DEVIATION RANGE switch: 25. OPERATION switch: 1000~. DEVIATION LEVEL control: 0 on KILOCYCLES DEVIATION meter. RF SET TO LINE control: right-hand meter pointer to redline. RF ATTENUATOR MICROVOLTS control: 0 microvolt on right-hand meter. *AN/URM-48 No. 2* BAND SWITCH: B. RF TUNING control: 30 mc. DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: 0 on KILOCYCLES DEVIATION meter. RF SET TO LINE control: right-hand meter pointer to redline. RF ATTENUATOR MICROVOLTS control: 0 microvolt on right-hand meter.	BAND switch: 30-52 mc. REC-TRANS FREQUENCY (mc) control: 30. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: Adjusted for a 1-volt indication on the ME-30A/U.	*a.* Set AN/URM-48 No. 2 DEVIATION LEVEL control for a 3-kc indication on the KILOCYCLES DEVIATION meter. Note the setting of DEVIATION LEVEL control; then return it to its extreme counterclockwise position. *b.* Set AN/URM-48 No. 1 DEVIATION LEVEL control for a 10 kc indication on the KILOCYCLES DEVIATION meter. *c.* Set AN/URM-48 No. 1 RF ATTENUATOR MICROVOLTS control for a reading of 10 on the right-hand meter. *d.* Turn the RT-505/PRC-25 function switch to the SQUELCH position. *e.* Set AN/URM-48 No. 2 DEVIATION LEVEL control to the position noted in *a* above. *f.* Set AN/URM-48 No. 1 RF ATTENUATOR MICROVOLTS control for a reading of 0 on the right-hand meter.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* ME-30A/U should indicate an output. ME-26B/U should indicate 0 ohm (squelch relay energized). *f.* ME-30A/U should indicate no output. ME-26B/U indicates an open circuit (infinite resistance) (squelch relay deenergized).
2	Same as step 1, except: *AN/URM-48 No. 1* BAND SWITCH: C. RF TUNING control: 41MC. *AN/URM-48 No. 2* BAND SWITCH: C. RF TUNING control: 41MC.	Same as step 1, except: REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON.	Repeat step 1 above	Same as step 1e and *f*.
3	Same as step 1, except: *AN/URM-48 No. 1* BAND SWITCH: C. RF TUNING control: 52MC. *AN/URM-48 No. 2* BAND SWITCH: C. RF TUNING control: 52MC.	Same as step 1, except: REC-TRANS FREQUENCY (mc) control: 52. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON.	Repeat step 1 above	Same as step 1e and *f*.
4	Same as step 1, except: *AN/URM-48 No. 1* BAND SWITCH: C. RF TUNING control: 53MC. *AN/URM-48 No. 2* BAND SWITCH: C. RF TUNING control: 53MC.	Same as step 1, except: REC-TRANS FREQUENCY (mc) control: 53. REC-TRANS FREQUENCY control (kc): 00. Function switch: ON.	Repeat step 1 above	Same as step 1e and *f*.
5	Same as step 1, except: *AN/URM-48 No. 1* BAND SWITCH: D. RF TUNING control: 65MC. *AN/URM-48 No. 2* BAND SWITCH: D. RF TUNING control: 65MC.	Same as step 1, except: REC-TRANS FREQUENCY (mc) control: 65. REC-TRANS FREQUENCY (kc) control: 00.	Repeat step 1 above	Same as step 1e and *f*.
6	Same as step 1, except: *AN/URM-48 No. 1* BAND SWITCH: E. RF TUNING control: 75MC. *AN/URM-48 No. 2* BAND SWITCH: E. RF TUNING control: 75MC.	Same as step 1, except: REC-TRANS FREQUENCY (mc) control: 75. REC-TRANS FREQUENCY (kc) control: 00.	Repeat step 1 above	Same as step 1e and *f*.

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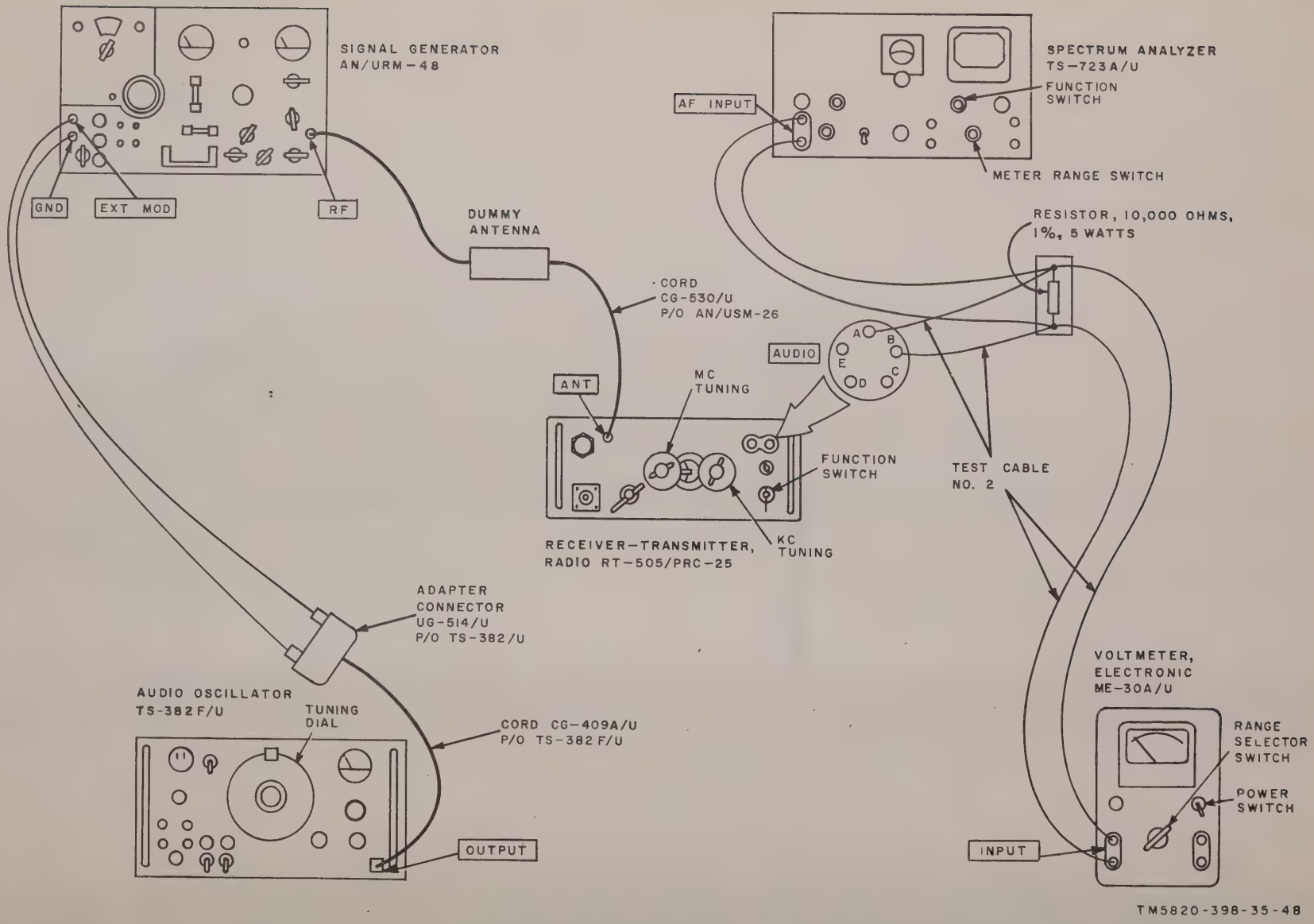

Figure 51. Receiver distortion test setup.

			c. Adjust the coarse FREQUENCY control (upper) until the TS-723A/U meter pointer dips sharply. d. Adjust the fine FREQUENCY control (lower) for the maximum dip of the TS-723A/U meter pointer. The tuning becomes more critical as the meter reading decreases. e. Adjust the BALANCE control for the minimum TS-723A/U meter reading. The tuning becomes more critical as the meter reading decreases. f. Readjust the FREQUENCY and BALANCE controls until no further reduction in the TS-723A/U meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a mid-scale meter indication. g. Note the distortion indication on the TS-723A/U meter.	c. None. d. None. e. None. f. None. g. TS-723A/U distortion indication of 5% or less.
3	Same as step No. 1.	Same as step No. 1.	a. Adjust the RT-505/PRC-25 VOLUME control for a 2-volt indication on the ME-30A/U. b. Disconnect the ME-30A/U ---------- c. Perform the procedures in step 2 above --------	a. None. b. None. c. TS-723A/U distortion indication of 10% or less.

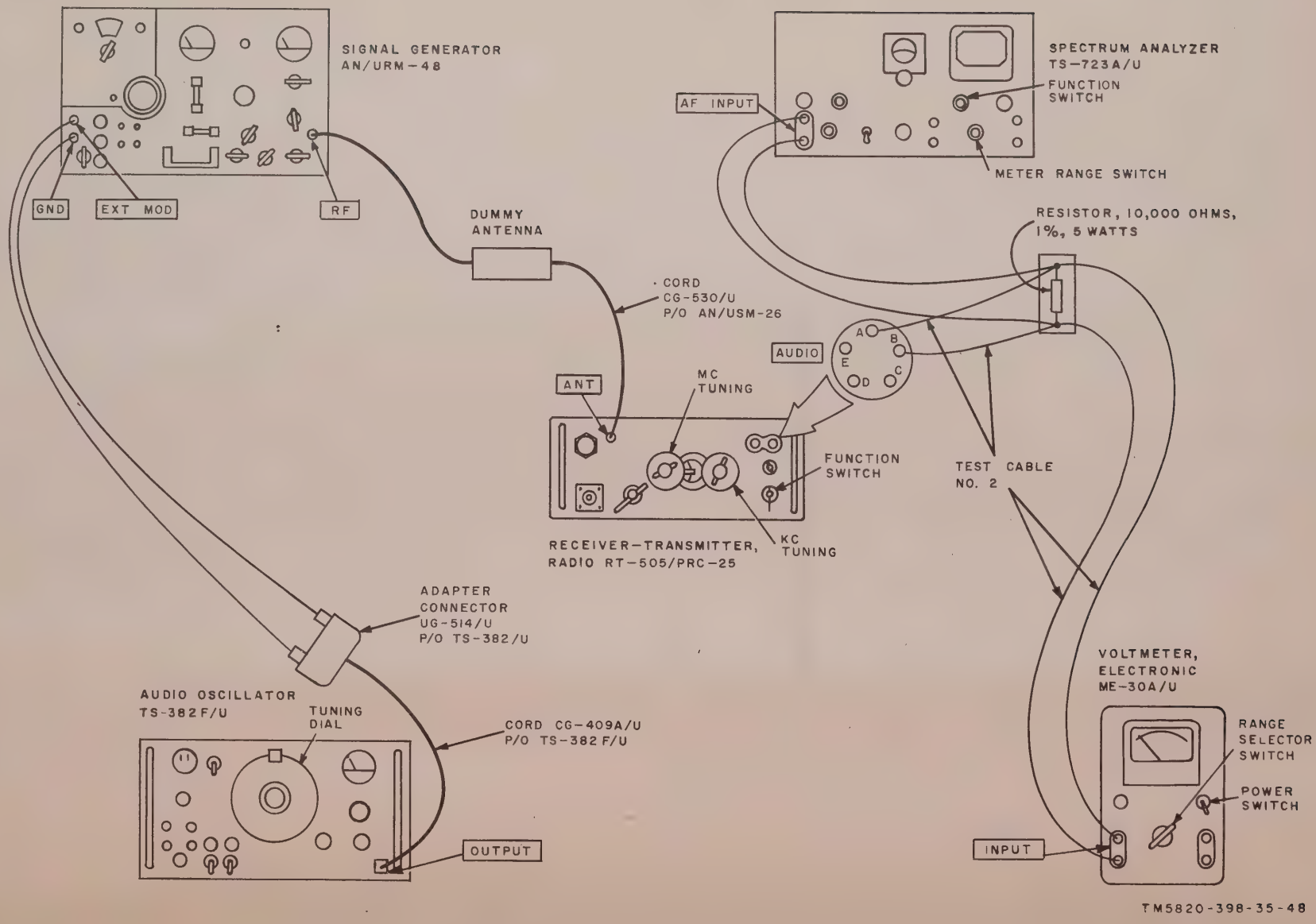

Figure 51. Receiver distortion test setup.

65. Receiver Distortion Test

a. Test Equipment and Materials.

(1) Signal Generator AN/URM-48.
(2) Spectrum Analyzer TS-723A/U.
(3) Voltmeter, Meter ME-30A/U.
(4) Audio Oscillator TS-382F/U.
(5) Dummy antenna.
(6) Resistor 10,000 ohms, ±1 percent, 5 watts.
(7) Cord CG-530/U.
(8) Test cable No. 2 (four required).

b. Test Connections and Conditions. Connect the test equipment as shown in figure 51. Turn on equipment and allow it to warmup for 5 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: 3 VOLTS, +10 DB. *TS-723A/U* Frequency RANGE switch: X10. FREQUENCY controls: dial indication of 100. Signal INPUT control: MIN. FUNCTION switch: SET LEVEL. Meter range switch: 100%. AF-RF selector switch: AF. *AN/URM-48* BAND SWITCH: C. RF TUNING control: 41MC. DEVIATION RANGE switch: 25. OPERATION switch: EXT MOD. DEVIATION LEVEL control: 10 on KILOCYCLES DEVIATION meter. RF SET TO LINE control: right-hand meter pointer to redline. RF ATTENUATOR MICROVOLTS control: 400. microvolts on right-hand meter. *TS-382F/U* FREQUENCY MULTIPLIER control: X10. Tuning dial: 100. OUTPUT MULTIPLIER switch: X1. OUTPUT CONTROL: fully clockwise.	BAND switch: 30-52 mc. REC-TRANS FREQUENCY (mc) control: 41. REC-TRANS FREQUENCY (kc) control: 00. Function switch: ON. VOLUME control: 0.	Adjust the RT-505/PRC-25 for a ME-30A/U meter indication of 1 volt.	None.
2	Same as step No. 1.	Same as step No. 1, except: VOLUME: adjusted for 1-volt indication on ME-30A/U.	Adjust the TS-723A/U as follows: *a.* Slowly rotate the signal INPUT control clockwise until the TS-723A/U meter pointer reaches full scale deflection. *b.* Turn the function switch to DISTORTION ------- *c.* Adjust the coarse FREQUENCY control (upper) until the TS-723A/U meter pointer dips sharply. *d.* Adjust the fine FREQUENCY control (lower) for the maximum dip of the TS-723A/U meter pointer. The tuning becomes more critical as the meter reading decreases. *e.* Adjust the BALANCE control for the minimum TS-723A/U meter reading. The tuning becomes more critical as the meter reading decreases. *f.* Readjust the FREQUENCY and BALANCE controls until no further reduction in the TS-723A/U meter reading can be obtained. As adjustment progresses, decrease the setting of the meter range switch to maintain a mid-scale meter indication. *g.* Note the distortion indication on the TS-723A/U meter.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* TS-723A/U distortion indication of 5% or less.
3	Same as step No. 1.	Same as step No. 1.	*a.* Adjust the RT-505/PRC-25 VOLUME control for a 2-volt indication on the ME-30A/U. *b.* Disconnect the ME-30A/U ---------- *c.* Perform the procedures in step 2 above --------	*a.* None. *b.* None. *c.* TS-723A/U distortion indication of 10% or less.

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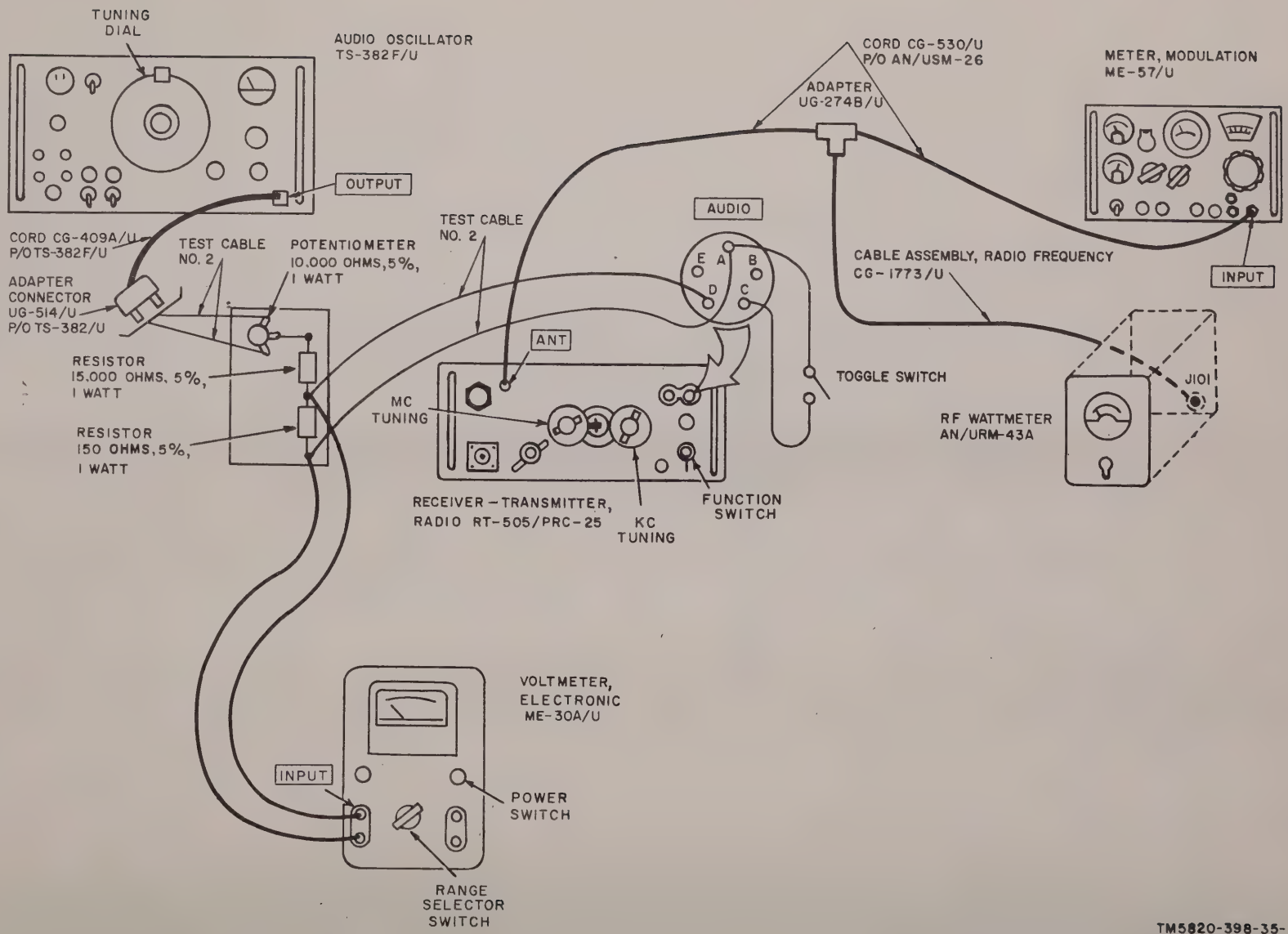


Figure 52. Transmitter deviation test setup.

			d. Repeat step 2 above	*d.* Indication should not be more than 1.414 times that indicated in step 2*g*.
7	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 52.	Same as step No. 1 except: REC-TRANS FREQUENCY (MC): 52.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 3.
8	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 54.	Same as step No. 4.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 4.
9	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 75.	Same as step No. 5.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 5.

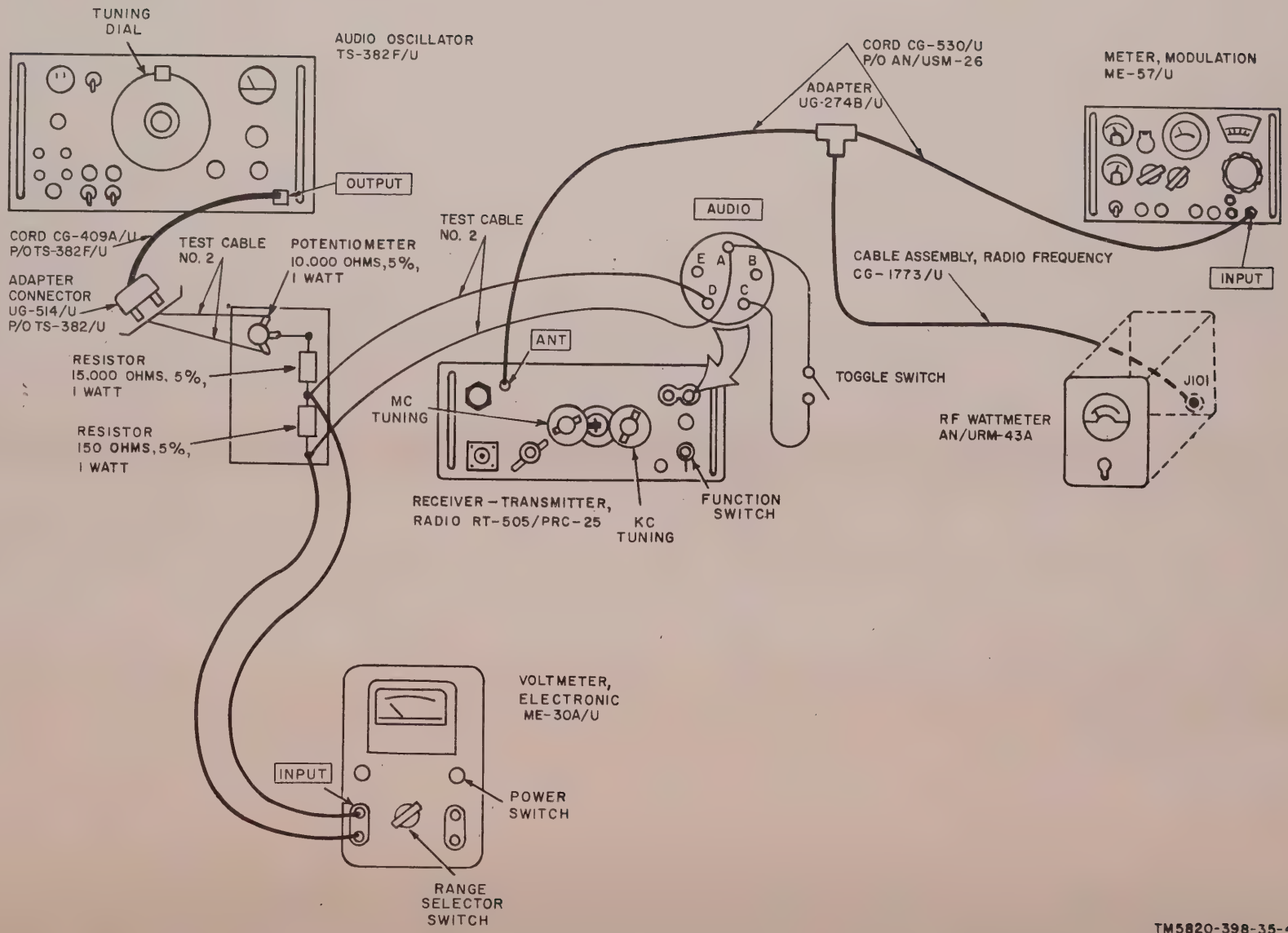


Figure 52. Transmitter deviation test setup.

66. Transmitter Deviation Test

a. Test Equipment and Materials.

(1) Audio Oscillator TS-382F/U.
(2) Voltmeter, Meter ME-30A/U.
(3) Meter, Modulation ME-57/U.
(4) RF Wattmeter AN/URM-43A.
(5) Test cable No. 2 (two required).
(6) Cable CG-1773/U.
(7) Adapter UG-274B/U.
(8) Potentiometer, 10,000 ohms, 5 percent, 1 watt.
(9) Resistor, 15,000 ohms, 5 percent, 1 watt.
(10) Resistor, 150 ohms, 5 percent, 1 watt.
(11) Toggle switch.

b. Test Connection and Conditions. Connect the test equipment as shown in figure 52. Turn on equipment and allow it to warmup for 30 minutes.

c. Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*ME-30A/U* Power switch: ON. Range selector switch: .003 VOLTS, -50DB. *TS-382F/U* FREQUENCY MULTIPLIER switch: X10. Tuning dial: 100. OUTPUT MULTIPLIER: X1. OUTPUT CONTROL: fully counterclockwise. *AN/URM-43A* 15W-60W switch: 15W. *ME-57/U* TUNE-FINE TUNE switch: TUNE. DEVIATION RANGE KC switch: 1000 TUNE. FREQUENCY RANGE-MC switch: 20-55. FREQUENCY RANGE-MC TUNING control: 30.	BAND switch: 30-52. REC-TRANS FREQUENCY (mc) control: 30. REC-TRANS FREQUENCY (kc) control: 00. VOLUME control: 0. Function switch: ON.	*a.* Adjust the TS-382F/U OUTPUT CONTROL until the ME-30A/U indicates 1.4 millivolts. *b.* Disconnect the TS-382F/U	*a.* None. *b.* None.
2	Same as step No. 1 above.	Same as step No. 1.	*a.* Close the toggle switch *b.* Rotate the ME-57/U TUNING control until the CARRIER SHIFT meter reads zero. *c.* Turn the ME-57/U TUNE-FINE TUNE switch to the FINE TUNE position. *d.* Rotate the ME-57/U TUNING control until the CARRIER SHIFT meter again reads zero. *e.* Adjust the RT-505/PRC-25 VOLUME control until the ME-57/U LIMITING meter reads in the black area. *f.* Reconnect the TS-382F/U as shown in figure 52 *g.* Rotate the ME-57/U DEVIATION RANGE KC control to obtain the highest upscale reading without pegging the meter. Record this indication. *Note:* If the 1,000-TUNE portion is used, multiply the 0-100 scale reading on the DEVIATION meter by 10. *h.* Open the toggle switch	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* Deviation should be 10 ±2 kc. *h.* None.
3	Same as step No. 1, except: *ME-57/U* FREQUENCY RANGE-MC TUNING control: 52.	Same as step No. 1, except: REC-TRANS FREQUENCY (mc) control: 52.	Repeat steps 1 and 2 above. Record reading	Same as step No. 2g above.
4	Same as step No. 1, except: *ME-57/U* FREQUENCY RANGE-MC TUNING control: 54.	Same as step No. 1, except: BAND switch: 53-75. REC-TRANS FREQUENCY (mc) control: 54.	Repeat steps 1 and 2 above. Record reading	Same as step No. 2g above.
5	Same as step No. 1, except: *ME-57/U* FREQUENCY RANGE-MC TUNING control: 75.	Same as step 4 above, except: REC-TRANS FREQUENCY (mc) control: 75.	Repeat steps 1 and 2 above. Record reading	Same as step No. 2g above.
6	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB.	Same as in step 1 above.	*a.* Connect ME-30A/U as shown in figure 52. Adjust the TS-382F/U OUTPUT CONTROL until the ME-30A/U indicates 7.1 millivolts. *b.* Disconnect ME-30A/U *c.* Disconnect TS-382F/U *d.* Repeat step 2 above	*a.* None. *b.* None. *c.* None. *d.* Indication should not be more than 1.414 times that indicated in step 2g.
7	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 52.	Same as step No. 1 except: REC-TRANS FREQUENCY (MC): 52.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 3.
8	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 54.	Same as step No. 4.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 4.
9	Same as step No. 1, except: *ME-30A/U* Range selector switch: .01 VOLTS, -40DB. *ME-57/U* FREQUENCY RANGE-MC TUNING control: 75.	Same as step No. 5.	Repeat step 6 above	Indication should not be more than 1.414 times that indicated in step 5.

67. Summary of Test Data

Personnel may find it convenient to arrange the checklist in a manner similar to that shown below.

Test	Test data	Performance standard
1. TRANSMITTER POWER OUTPUT		
a. 30.00 mc	-	2 watts minimum
b. 42.00 mc	-	2 watts minimum
c. 52.95 mc	-	2 watts minimum
d. 53.00 mc	-	1.5 watts minimum
e. 65.00 mc	-	1.5 watts minimum
f. 75.95 mc	-	1.5 watts minimum
2. TONE OSCILLATOR FREQUENCY AND TRANSMITTER MODULATION		
a. Frequency deviation at 41.00 mc	-	3.0 kc ±0.5
b. Modulating frequency at 41.00 mc	-	150 cps ±1.5
3. SYSTEM DISTORTION		
Distortion at 41.00 mc	-	10% max
4. FREQUENCY ACCURACY		
a. 75.00 mc	-	75.00 mc ±3.5 kc
b. 75.05 mc	-	75.05 mc ±3.5 kc
c. 75.10-75.90 mc (in 100-kc increments)	-	75.10-75.90 mc ±3.5 kc
d. 75.95 mc	-	75.95 mc ±3.5 kc
e. 52.00 mc	-	52.00 mc ±3.5 kc
5. MAXIMUM SIGNAL PLUS NOISE-TO-NOISE RATIO		
At 41.00 mc	-	Not less than 40 db greater than indication in test procedure step 1*b* (para 60*c*).
6. RECEIVER AUDIO OUTPUT POWER		
At 41.00 mc	-	Not less than 2 volts on ME-30A/U.
7. RECEIVER SENSITIVITY		
a. 30.00 mc	-	10 db less in DISTORTION position than SET LEVEL position on TS-723A/U.
b. 41.00 mc	-	Same as above.
c. 52.00 mc	-	Same as above.
d. 53.00 mc	-	Same as above.
e. 65.00 mc	-	Same as above.
f. 75.95 mc	-	Same as above.
8. RECEIVER CATCHING RANGE		
a. 31.50 mc	-	300 kc minimum deviation above and below 31.50 mc.
b. 51.50 mc	-	300 kc minimum deviation above and below 31.50 mc.
9. SQUELCH SENSITIVITY		
a. Function switch in SQUELCH (30.00 mc).	-	Squelch relay energizes when specified audio level is present.
b. Function switch in SQUELCH (41.00 mc).	-	Same as above.
c. Function switch in SQUELCH (52.00 mc).	-	Same as above.
d. Function switch in SQUELCH (53.00 mc).	-	Same as above.
e. Function switch in SQUELCH (65.00 mc).	-	Same as above.
f. Function switch in SQUELCH (75.00 mc).	-	Same as above.
10. RECEIVER DISTORTION		
a. At 41.00 mc	-	5% max
b. At 2-volt output	-	10% max
11. TRANSMITTER DEVIATION. (ME-30A/U range selector switch at .003 VOLTS, -50DB)		
a. 30.00 mc	-	10 kc ±2
b. 52.00 mc	-	10 kc ±2
c. 54.00 mc	-	10 kc ±2
d. 75.00 mc	-	10 kc ±2
12. TRANSMITTER DEVIATION. (ME-30A/U range selector switch at .01 VOLTS, -40DB)		
a. 30.00 mc	-	Less than 1.414 of 11*a*.
b. 52.00 mc	-	Less than 1.414 of 11*b*.
c. 54.00 mc	-	Less than 1.414 of 11*c*.
d. 75.00 mc	-	Less than 1.414 of 11*d*.

CHAPTER 5

FIFTH ECHELON MAINTENANCE

68. Scope of Fifth Echelon Maintenance

The functions allocated to fifth echelon maintenance level include troubleshooting, repair, and alignment of modular assemblies. Also included is replacement of parts in the selector mechanism assembly and in module A10.

69. Test Equipment and Additional Equipment Required

a. Test Equipment.

Item	Technical manual
Audio Oscillator TS-382F/U	TM 11-6625-261-12
Voltmeter, Meter ME-30A/U	TM 11-6625-320-12
Frequency Meter AN/USM-26	TM 11-5057
Meter, Modulation ME-57/U	TM 11-6625-400-12
Multimeter ME-26B/U --------	TM 11-6625-200-12
Oscilloscope AN/USM-50A----	TM 11-5129
R. F. Signal Generator AN/URM-25F.	TM 11-5551E
Signal Generator AN/URM-48	TM 11-1257
Radio Frequency Wattmeter AN/URM-43A.	TM 11-5133
Spectrum Analyzer TS-723B/U	TM 11-5097
RF Millivoltmeter 411A	
Transistor Power Supply 721A	

b. Additional Equipment Required.

(1) Battery cable; a three-conductor cable of suitable length, with a battery plug on one end, and a battery receptable on the other.
(2) Alignment cover (fig. 28).
(3) Module extender (fig. 27).
(4) Adapter UG-274B/U.
(5) Resistor, 470-ohm, 1-watt.
(6) Handset H-138/U.
(7) Dummy antenna (fig. 41).

70. General

***Caution:* Refer to the caution notice on the inside front cover of this manual before connecting equipment or making tests.**

a. The module assembly trouble isolation procedures given in this chapter are organized to localize and isolate trouble in defective modules of the RT-505/PRC-25. A separate procedure is provided for each module. Each procedure, where applicable, consists of preparation instructions, test and alignment procedures, and faulty part isolation information.

b. Rf test signals are unmodulated unless otherwise specified. When the frequency of a signal generator is specified without an accompanying tolerance (an example of frequency with a tolerance specified is 29, 950 kc ±5), set the frequency, by using the AN/USM-26, to the exact number of significant figures designated.

c. Use a receiver-transmitter (that is known to be good) as a test set. When working on a module, remove the cover and plug the module into the test set. When alignment is required, replace those covers that have alignment holes. Use the module extender (fig. 27) only when directed.

(1) Remove Battery Box CY-2562/PRC-25 from the receiver-transmitter case.
(2) Remove the receiver-transmitter case from the receiver-transmitter.
(3) Connect the battery cable between Battery, Dry BA-386/PRC-25 (that is known to be good) and the battery plug on the receiver-transmitter.
(4) Turn on the test equipment and allow a 5-minute warmup period.

***Caution:* Do not place the receiver-transmitter in a transmit condition with a wattmeter connected or an antenna installed.**

***Warning:* The power amplifier plate voltage is +150 volts dc. Take all necessary precautions to protect personnel and test equipment.**

71. Isolating Trouble in Module A1 (fig. 26 and 53)

a. Preparation.

(1) Prepare the following equipment:
(a) Multimeter ME-26B/U.
(b) Handset H-138/U.

(2) Connect the handset to either AUDIO connector.

b. Performance Test.

(1) Press the handset push-to-talk switch.

(2) Set the ME-26B/U to the 300-volt, dc range. Normal indication at J3 is +125 volts; normal indication at J2 is -45 volts dc.

c. Faulty Part Isolation.

Note: Make all measurements with respect to ground unless otherwise specified.

(1) Measure the dc resistances at the points listed below and compare them with the normal resistances.

Point of measurement	Meter indications (ohms)	
	Negative lead grounded	Positive lead grounded
Q1 base ----------	1000	1.2
Q1 emitter to J1 pin C	8	100
Q1 collector --------	0	0
Q2 base ----------	1000	1.2
Q2 emitter to J1 pin C	8	100
Q2 collector	0	0
CR1-A1CR4 junction	470K	50
CR3-A1CR2 junction	1 meg	40
J2----------	1.5 meg	1.5 meg
J3 ----------	1.5 meg	1.5 meg

(2) After replacing a faulty part, repeat the procedures given in *b* above.

72. Isolating Trouble in Module A2 (fig. 15 and 54)

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Signal Generator AN/URM-48.
- *(b)* Frequency Meter AN/USM-26.
- *(c)* Dummy antenna (fig. 41).
- *(d)* Adapter UG-274B/U.
- *(e)* Rf Millivoltmeter 411A.

(2) Connect a Cord CG-530/U (part of the AN/USM-26) between ANT connector J2 on the receiver-transmitter and one end of the dummy antenna.

(3) Connect the output of the AN/URM-48 to a male connector of the UG-274B/U.

(4) Connect the AN/USM-26 to the other male connector of the UG-274B/U.

(5) Connect the female connector of UG-274B/U to the connector on the other end of the dummy antenna.

(6) Set the AN/URM-48 frequency to 30,000 mc as indicated on the AN/USM-26. Adjust the deviation for ±10 kc at 1,000 cps.

(7) Set the receiver-transmitter front panel controls as follows:
- *(a)* BAND switch at 30-52.
- *(b)* Tuning knobs at 30.00 mc.
- *(c)* Function switch at ON.

b. Bandwidth Test.

(1) Connect the 411A between pins 1 and 4 of A2J1.

(2) Adjust the output of the AN/URM-48 for a 25-millivolt indication on the 411A.

(3) Disconnect the 411A from pins 1 and 4 of A2J1 and connect it between pins 2 and 3 of A2J1. The 411A should indicate 4.5 db less than the indication noted in (2) above. (This value, -4.5 db, is the input-to-output voltage ratio.)

(4) Adjust the AN/URM-48 level to obtain a 0-db indication on the 411A.

(5) Increase the AN/URM-48 frequency until the 411A indicates a 3-db decrease. Record this frequency.

(6) Decrease the AN/URM-48 frequency to obtain a 0-db indication on the 411A.

(7) Further decrease the AN/URM-48 frequency until the 411A indicates a 3-db decrease. Record this frequency.

(8) Return the AN/URM-48 frequency to obtain a 0-db indication on the 411A.

(9) Compute the difference between the frequencies recorded in (5) and (7) above. The frequency difference is the 3-db bandwidth, which should be 400 kc.

(10) Adjust the AN/URM-48 frequency to 52.950 mc as indicated by the AN/USM-26.

(11) Repeat (1) through (9) above. The input-to-output voltage ratio noted in (3) should be -3.0 db; the 3-db bandwidth computed in the

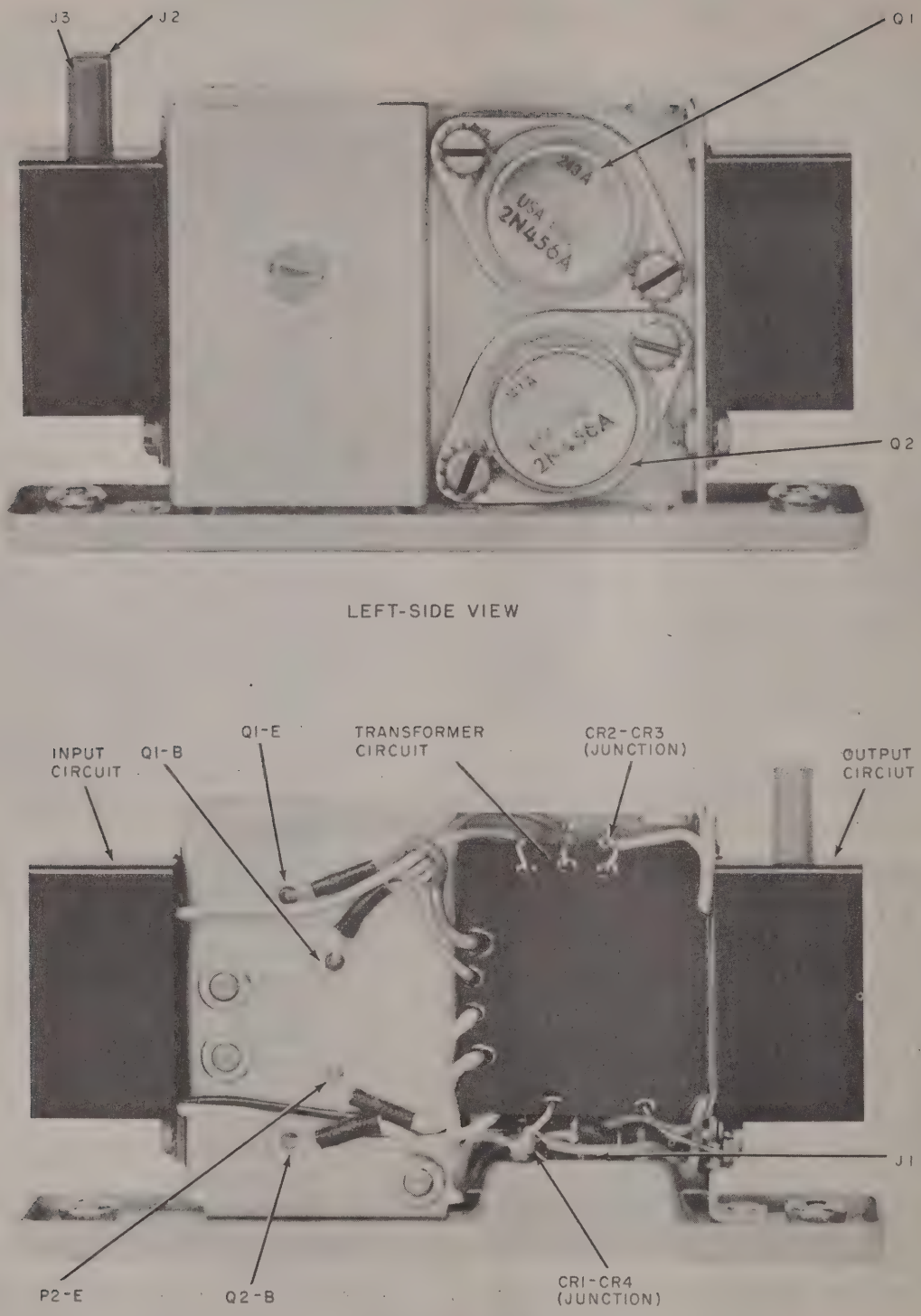


Figure 53. Module A1 parts location.

procedure given in (9) above should be 1,100 kc.

(12) Change the receiver-transmitter BAND switch to 53-75.

(13) Adjust the AN/URM-48 frequency to 53.000 mc as indicated by the AN/USM-26.

(14) Repeat the procedures given in (1) through (9) above. The input-to-output voltage ratio noted in (3) above should be +1 db; the 3-db bandwidth computed in the procedure given in (9) above should be 3,300 kc.

(15) Adjust the AN/URM-48 frequency to 75.950 mc as indicated by the AN/USM-26.

(16) Repeat the procedures given in (1) through (9) above. The input-to-output voltage ratio noted in (3) above should be -0.5 db; the 3-db bandwidth computed in the procedure given in (9) above should be 15,000 kc.

(17) If the bandwidth or the input-to-output voltage ratio does not meet the given standards, proceed to *c* below.

c. Faulty Parts Isolation.

(1) Adjust the AN/URM-48 for a 25-millivolt rf signal at the frequencies indicated in the chart below and measure the voltages at the switch terminals listed. Compare them with the normal signals listed.

Note: Measure all voltages to ground.

Point of measurement	Frequency input (mc)	Millivolts (rms)
S1D-2	30	23.5
S1A-2	30	135.0
S1C-2	30	140.0
S1D-2	53	26.0
S1A-2	53	70.0
S1C-2	53	42.0

(2) After replacing a faulty part, perform the alignment procedures given in *d* and *e* below and then repeat the procedures given in *a* and *b* above.

d. Preparation for Alignment. Set the receiver-transmitter front panel controls as follows:

(1) BAND switch at 30-52.

(2) Tuning knobs for 30.00 mc.

(3) Function switch at ON.

e. Alignment Procedures.

(1) Connect the 411A between pins 1 and 4 of A2J1.

(2) Adjust the output of the AN/URM-48 for 30.00 mc and a 25-millivolt indication on the 411A.

(3) Disconnect the 411A from pins 1 and 4 of A2J1 and connect it between pins 2 and 3 of A2J1.

(4) Tune transformer T1 for a peak voltage indication on the 411A.

(5) Set the receiver-transmitter tuning knobs at 52.95 mc, and adjust the AN/URM-48 to 52.95 mc.

(6) Tune capacitor C1 for a peak voltage indication on the 411A.

(7) Repeat the procedures given in (1) through (6) above until the 411A indication for 30.00 mc and 52.95 mc can no longer be increased by tuning.

(8) Set the receiver-transmitter front panel controls as follows:

(a) BAND switch at 53-75.

(b) Tuning knobs at 53.00 mc.

(9) Repeat the procedures given (1), (2), and (3) above, except change the frequency noted in (2) above to 52.95 mc.

(10) Tune transformer T2 for a peak voltage indication on the 411A.

(11) Set the receiver-transmitter tuning knobs at 75.95 mc, and adjust the AN/URM-48 frequency to 75.95 mc.

(12) Tune capacitor C2 for a peak voltage indication on the 411A.

(13) Repeat the procedures given in (9) through (12) above until the 411A indication for 53.00 mc and 75.95 mc cannot be increased by tuning.

73. Isolating Trouble Within Modules A3 and A4

Because modules A3 and A4 are similar, their maintenance procedures are similar. Refer to figures 1 and 2 for schematic

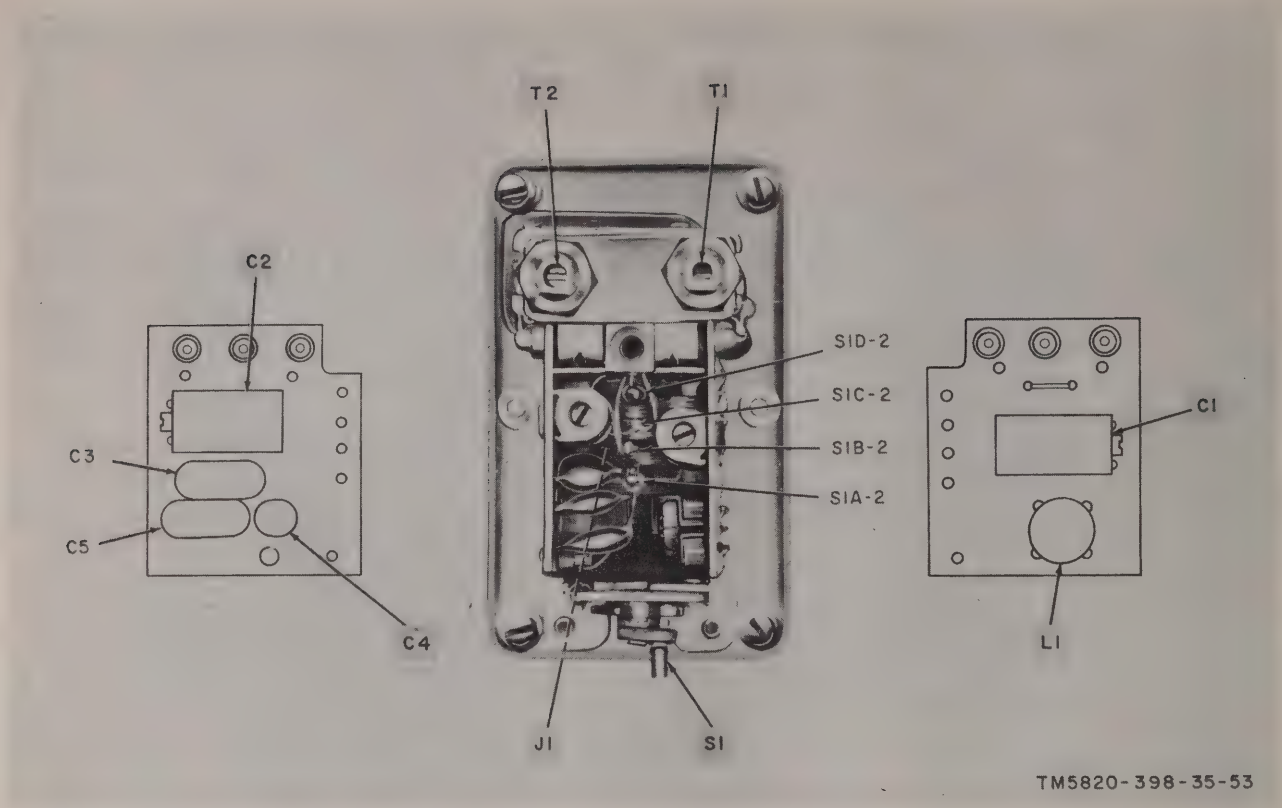


Figure 54. Module A2 parts location.

diagrams and to figures 55 and 56 for test points and parts location.

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Signal Generator AN/URM-48.
- *(b)* Frequency Meter AN/USM-26.
- *(c)* Rf Millivoltmeter 411A.
- *(d)* Adapter UG-274B/U.
- *(e)* Multimeter ME-26B/U.

(2) Connect the AN/URM-48 output to a male connector of the UG-274B/U.

(3) Connect the AN/USM-26 to the other male connector of the UG-274B/U.

(4) Connect the female end of the UG-274B/U to the receiver-transmitter ANT connector.

(5) Set the AN/URM-48 frequency to 30.00 mc; set the deviation to 10 kc at 1,000 cps.

b. Gain and Bandwidth Test.

(1) Connect the 411A to J2 of the module under test.

(2) Adjust the AN/URM-48 frequency to 30.00 mc and the level to 10 millivolts as indicated by the 411A.

(3) Disconnect the 411A from J2 and connect it between pins 3 and 4 of J1 in the module under test. Note the output level.

(4) Compute the gain by subtracting the input db level noted in (2) above from the output db level noted in (3) above. Normal gain is 16 db or greater.

(5) Reconnect the 411A to test point J2 of the module under test.

(6) Increase the AN/URM-48 level until the 411A indicates 20 millivolts.

(7) Repeat the procedure given in (3) above.

(8) Decrease the AN/URM-48 frequency until the output level indicated by the 411A is at the level

noted in (3) above. Record the frequency.

(9) Increase the AN/URM-48 frequency until the output level indicated by the 411A is again at the level noted in (3) above. Record the frequency.

(10) Compute the difference between the frequencies noted in (8) and (9) above. The frequency difference is the 6-db bandwidth, which should be 700 kc.

(11) Repeat the procedures given in (1) through (10) above for A3 at 52.95 mc, 53.00 mc, and 75.95 mc. The gain noted in (4) above should be 14 db, 12 db, and 12 db respectively. The bandwidth computed in the procedures given in (10) above should be 2,000 kc, 2,500 kc, and 6,700 kc, respectively.

(12) Repeat the procedures given in (1) through (10) above for A4 at 30.00 mc, 52.95 mc, 53.00 mc, and 75.95 mc. The gain noted in (4) above should be 13.5 db, 19 db, 15 db, and 13.5 db respectively. The bandwidth computed in (10) above should be 700 kc, 1,200 kc, 1,600 kc, and 3,100 kc respectively.

(13) If either the gain or bandwidth tests or both do not meet the outlined standards of the procedure, proceed to *d* and *e* below.

c. Faulty Parts Isolation.

(1) Apply a 30.00 mc signal to the receiver-transmitter ANT connector, adjusted to 10 millivolts at test point J2 of A3. Measure the voltages at the points outlined below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)	
	A3	A4
Q1 collector ------	125	580
Q1 base ----------	12	77
Q1 emitter--------	15	94
J1-1 -------------	10	57
J1-4 -------------	57	340

(b) Dc voltage chart.

Point of measurement	Volts (dc)	
	A3	A4
C4-L1 junction ----	10	10
Q1 collector ------	10	10
Q1 base ----------	1.3	1.3
Q1 emitter--------	0.6	0.6
J1-1 -------------	0.0	0.0
J1-4 -------------	0.0	0.0

(2) After the replacement of a faulty part, perform the alignment procedure given in *d* and *e* below and repeat the procedures given in *a* and *b* above.

d. Preparation for Alignment.

(1) Set the receiver-tansmitter front panel controls as follows:

(a) Set the BAND switch and the tuning knobs at the AN/URM-48 frequency.

(b) Set the function switch at ON.

(c) Remove A5.

(2) Connect a shorting jumper between pins E and H of J9 (receptacle for A5).

e. Alignment Procedures.

(1) Adjust the AN/URM-48 output frequency to 30.00 mc. Connect the 411A between pin B of J9 and ground.

(2) Tune transformer T2 for a peak indication on the 411A.

(3) Change the AN/URM-48 frequency to 52.00 mc.

(4) Tune capacitor C7 for a peak indication on the 411A.

(5) Repeat the procedures given in (1) through (4) above until the 411A indication for 30.00 mc and 52.00 mc cannot be increased by tuning.

(6) Adjust the AN/URM-48 and the receiver-transmitter to 53.00 mc.

(7) Tune transformer T3 for a peak indication on the 411A.

(8) Change the AN/URM-48 and the receiver-transmitter frequency to 75.95 mc.

(9) Tune capacitor C9 for a peak indication on the 411A.

(10) Repeat the procedures given in (6) through (9) above until the 411A

indication cannot be increased by tuning.

(11) Remove the shorting jumper from pins E and H of J9.

(12) Replace A5.

74. Isolating Trouble in Module A5 (fig. 3 and 57)

a. Preparation.

(1) Prepare the following equipment:

(a) Signal Generator AN/URM-48.

(b) Frequency Meter AN/USM-26.

(c) Rf Millivoltmeter 411A.

(d) Adapter UG-274B/U.

(e) Multimeter ME-26B/U.

(2) Connect the AN/URM-48 output to a male connector of the UG-274B/U.

(3) Connect the AN/USM-26 to the other male connector of the UG-274B/U.

(4) Connect the female connector of the UG-274B/U to the receiver transmitter ANT connector.

(5) Adjust the AN/URM-48 frequency for 30.00 mc, with a deviation of 10 kc at 1,000 cps.

b. Gain and Bandwidth Test.

(1) Connect the 411A between pins B and A of A5J1.

(2) Adjust the AN/URM-48 level to obtain a 50-millivolt indication on the 411A. (Note the db indication.)

(3) Disconnect the 411A from pins A and B; connect it between pins C and D of A5J1. Note the db indication.

(4) Compute the gain by subtracting the db level noted in (2) above from the db level noted in (3). Normal gain is 2.5 db.

(5) Connect the 411A between A21J3 and chassis ground and note the db level.

(6) Repeat the procedures given in (1) and (2) above, except adjust the AN/URM-48 level to obtain a 100-millivolt indication on the 411A.

(7) Disconnect the 411A from pins A and B of A5J1 and connect it between A21J3 and chassis ground.

(8) Decrease the AN/URM-48 frequency until the level indicated by the 411A is again at the level noted in (5) above. Record the frequency.

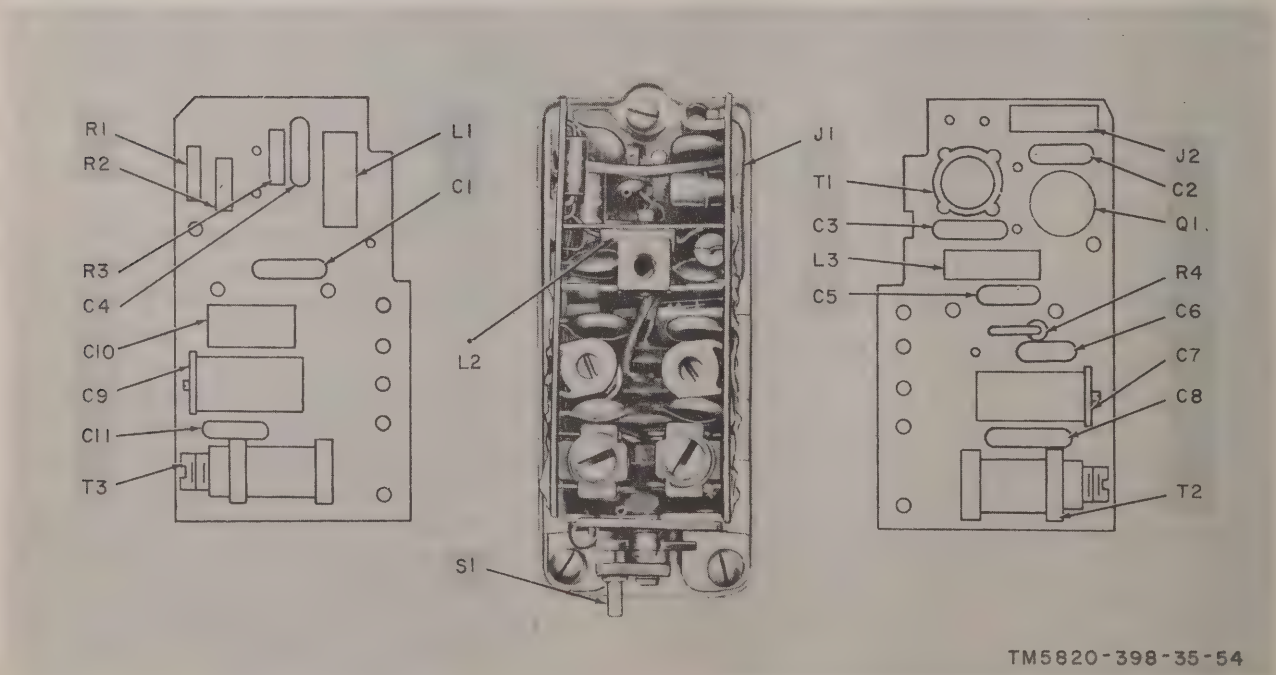


Figure 55. Module A3 parts location.

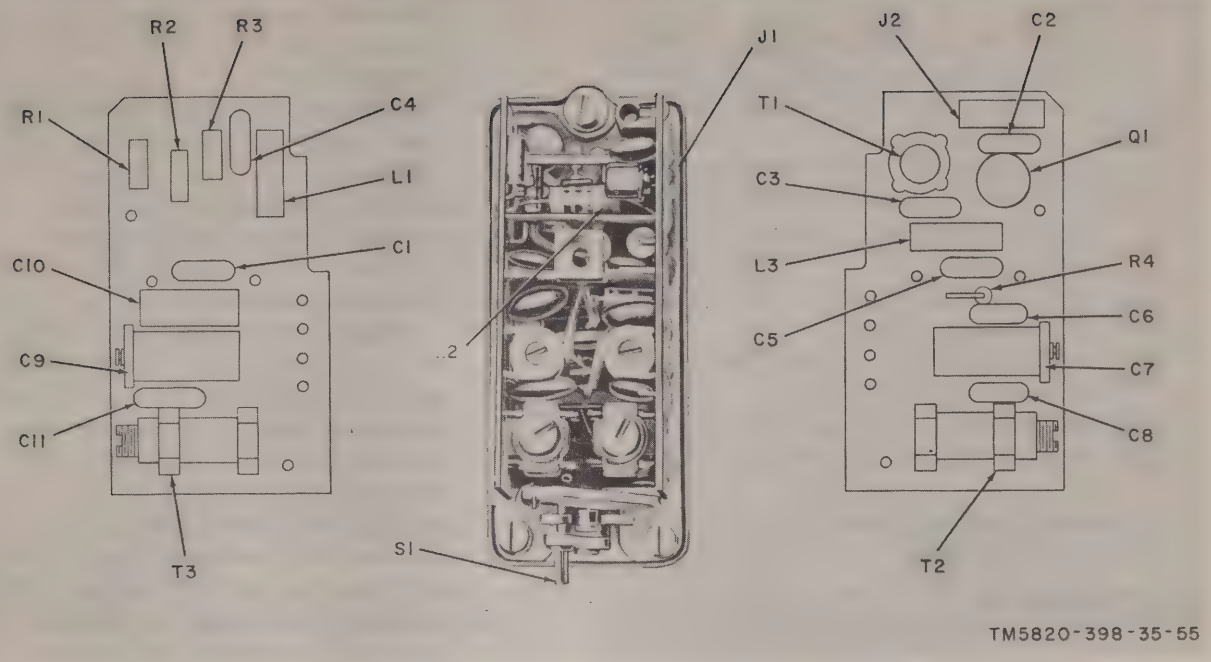


Figure 56. Module A4 parts location.

(9) Increase the AN/URM-48 frequency until the level indicated by the 411A is again at the level noted in (5) above. Record the frequency.

(10) Compute the difference between the frequencies noted in (8) and (9) above. The frequency difference is the 6-db bandwidth, which should be at least 32 kc.

(11) Perform the procedures given in (1) through (10) above for 75.95 mc, except that normal gain in (4) above is 0 db.

(12) If either the gain or bandwidth tests or both do not meet the outlined standards of the procedure, proceed to *e* and *f* below.

c. Faulty Parts Isolation.

(1) Apply a 30.00-mc, 10-millivolt signal to the module under test. Measure the voltages at the points outlined below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
Q1 collector	100
J2	73
Q1 base	10
R9-C6 junction	97
Q2 collector	360
Q2 base	8.6
Q2 emitter	1.7

(b) Dc voltage chart.

Point of measurement	Volts (dc)
J1-G	10
Q1 collector	9.8
Q1 base	0.65
Q1 emitter	0.0
Q2 base	8.4
Q2 emitter	8.8
Q2 collector	0.0

(2) After the replacement of a faulty part, perform the alignment procedure given in *d* and *e* below and repeat the procedures given in *a* and *b* above.

d. Preparation for Alignment. Set the

receiver-transmitter front panel controls as follows:

(1) Turn the BAND switch to 30-52.
(2) Turn the tuning knobs to 30.00 mc.
(3) Turn the function switch to ON.

e. Alignment Procedure.

(1) Adjust the AN/URM-48 frequency to 30.000 mc and adjust the output for 10 millivolts between pins A and B of A5J1.
(2) Connect the 411A between A21J3 and chassis ground.
(3) Adjust A5T2 for a peak indication on the 411A.
(4) Disconnect all connections.
(5) Replace the module cover.

75. Isolating Trouble in Module A6
(fig. 13 and 58)

a. Preparation.

(1) Prepare the following equipment:
(a) Frequency Meter AN/USM-26.
(b) Signal Generator AN/URM-48.
(c) Rf Millivoltmeter 411A.
(d) Handset H-138/U.
(e) Rf Wattmeter AN/URM-43A.
(f) Multimeter ME-26B/U.

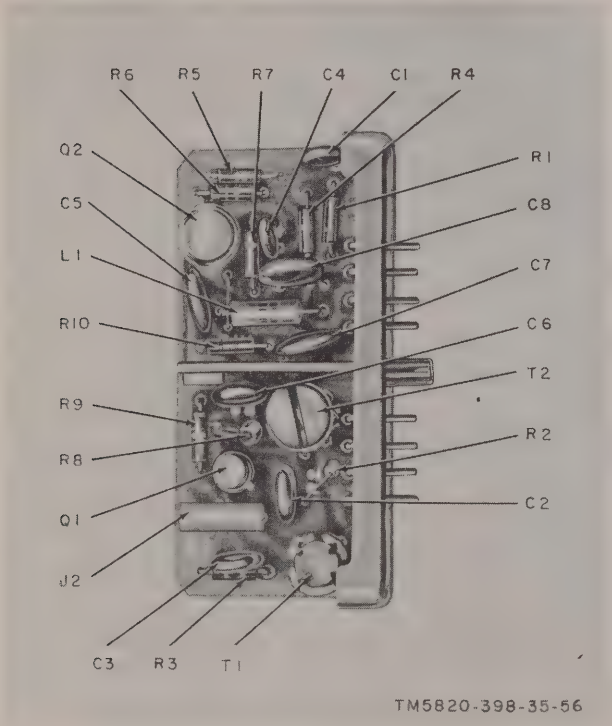


Figure 57. Module A5, parts location.

(2) Connect the H-138/U to an AUDIO connector.
(3) Connect the AN/URM-43A to ANT connector J2.
(4) Place the front panel controls of the Receiver-Transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs to 30.00 mc.
(c) Function switch at ON.
(5) Remove module A7.
(6) Connect the output of the AN/URM-48 to the input of AN/USM-26. Adjust AN/URM-48 for 30.000 mc, as indicated by the AN/USM-26.
(7) Press the push-to-talk switch on the H-138/U.

b. Gain and Bandwidth Test.

(1) Connect the output of the AN/URM-48 between pins 1 and 2 of A6J1.
(2) Connect the 411A across the AN/URM-48 output. Adjust the AN/URM-48 for a 100-millivolt indication on the 411A. (Note the db indication.)
(3) Disconnect the 411A from the AN/URM-48 and connect it between pins 1 and 2 of S1J1. The 411A should indicate 22 db more than the indication obtained in the procedure given in (2) above. (This value, +22 db, is the stage gain.)
(4) Adjust the AN/URM-48 level to obtain a 0-db indication on the 411A. Increase the AN/URM-48 frequency until the 411A indicates a 3-db decrease.
(6) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Decrease the frequency of the AN/URM-48 to 30.00 mc.
(7) Connect the AN/URM-48 between pins 1 and 2 of A6J1.
(8) Decrease the frequency of the AN/URM-48 until the 411A indicates a 3-db decrease.
(9) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Increase the AN/URM-48 frequency to 30.00 mc.
(10) Compute the difference between the frequencies recorded in the procedure given in (6) and (9) above. The

frequency difference is the 3-db bandwidth, which should be 1,200 kc.

(11) Adjust the AN/URM-48 frequency to 52.95 mc as indicated by the AN/USM-26.

(12) Repeat the procedure given in (1) through (10) above; return the AN/URM-48 to 52.95 mc noted in (6) and (9) above.

(13) The gain noted in (3) above should be +21 db; the 3-db bandwidth computed in the procedure given in (10) above should be 900 kc.

(14) Change the receiver-transmitter BAND switch to 53-75.

(15) Adjust the AN/URM-48 frequency to 53.00 mc as indicated by the AN/USM-26.

(16) Repeat the procedure given in (1) through (10) above; return the AN/URM-48 to 53.00 mc instead of the indication given in (6) and (9) above.

(17) The gain noted in (3) above should be +18 db; the 3-db bandwidth computed in the procedure given in (10) above should be 1,300 kc.

(18) Adjust the AN/URM-48 frequency to 75.95 mc as indicated by the AN/USM-26.

(19) Repeat the procedure given in (1) through (10) above; return the AN/URM-48 to 75.95 mc instead of the indication given in (6) and (9) above.

(20) The gain noted in (3) above should be +12 db; the 3-db bandwidth computed in the procedure given in (10) above should be 4,000 kc.

(21) Replace module A7.

(22) If the gain and bandwidth do not meet the outlined standards of the procedure, proceed to *c* below.

c. Faulty Parts Isolation.

(1) Remove module A7. Connect the H-138/U to an AUDIO connector and press the push-to-talk switch. Apply a 30.00 mc, 100-millivolt signal between pins 1 and 2 of A6J1. Measure the voltages at the points outlined below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
J2	0.100
Q1 emitter	0.054
Q1 collector	1.3
Q1 base	0.044

(b) Dc voltage chart.

Point of measurement	Volts (dc)
J1-3	-45
Q1 emitter	-39
Q1 base	-38
Q1 collector	0

(2) After the replacement of a faulty part, perform the alignment procedure given in *d* and *e* below and repeat the procedures given in *a* and *b* above.

d. Preparation for Alignment.

(1) Set the receiver-transmitter front panel controls as follows:

(a) BAND switch at 30-52.

(b) Function switch at ON.

(2) Connect the AN/URM-43A to ANT connector J2.

(3) Remove module A7.

(4) Connect the AN/URM-48 between pins 1 and 2 of A6J1.

e. Alignment Procedure.

(1) Set the receiver-transmitter tuning knobs for 30.00 mc.

(2) Connect the 411A across the output of the AN/URM-48.

(3) Connect the H-138/U to an AUDIO and press the push-to-talk switch.

(4) Adjust the AN/URM-48 frequency to 30.00 mc and the level to 100 millivolts, as indicated by the 411A.

(5) Disconnect the 411A from the AN/URM-48 and connect it between pins 1 and 2 of S1J1.

(6) Adjust T2 for a peak indication on the 411A.

(7) Change the AN/URM-48 frequency and the receiver-transmitter tuning knobs to 52.95 mc.

(8) Adjust C6 for a peak indication on the 411A.

(9) Repeat the procedures given in (1) through (8) above until the 411A indication cannot be increased by tuning.
(10) Set the BAND switch on the receiver-transmitter at 53-75, and the tuning knobs at 53.00 mc.
(11) Disconnect the 411A from J1S1 and connect it across the AN/URM-48 output.
(12) Adjust the AN/URM-48 frequency to 53.00 mc and the level to 100 millivolts, as indicated by the 411A.
(13) Disconnect the 411A from the AN/URM-48 and connect it between pins 1 and 2 of S1J1.
(14) Adjust T3 for a peak indication on the 411A.
(15) Change the AN/URM-48 frequency and the RT-505/PRC-25 tuning knobs to 75.95 mc.
(16) Adjust C8 for a peak indication on the 411A.
(17) Repeat (10) through (16) above until the 411A indication cannot be increased by tuning.
(18) Replace A7.

76. Isolating Trouble in Module A7 (fig. 12 and 59)

a. Preparation

(1) Prepare the following equipment:
(a) Frequency Meter AN/USM-26.
(b) Signal Generator AN/URM-48.
(c) Rf Millivoltmeter 411A.
(d) Handset H-138/U.
(e) Rf Wattmeter AN/URM-43A.
(f) Multimeter ME-26B/U.
(2) Connect the H-138/U to an AUDIO connector.
(3) Connect the AN/URM-43A to ANT connector J2.
(4) Set the front panel controls of the receiver-transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs at 30.00 mc.
(c) Function switch at ON.
(5) Remove module A8.
(6) Connect the AN/URM-48 output to the input of the AN/USM-26. Adjust the AN/URM-48 for 30.000 mc, as indicated by the AN/USM-26.

b. Gain and Bandwidth Test.

(1) Connect the output of AN/URM-48 between pins 1 and 2 of J1.

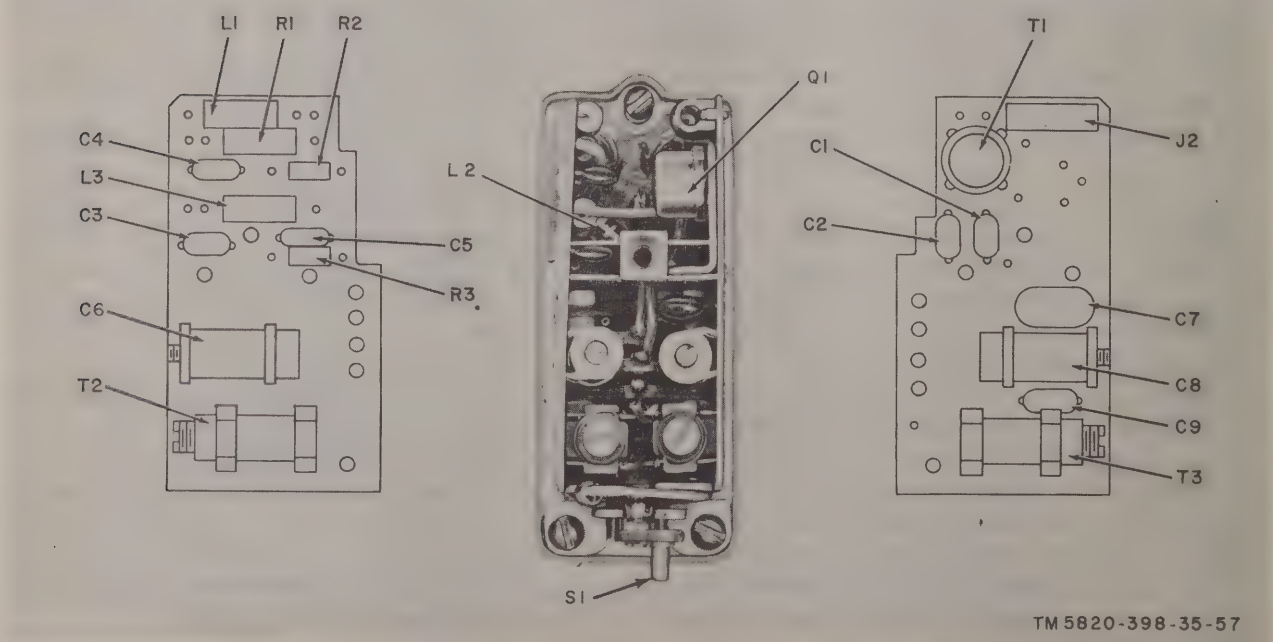


Figure 58. Module A6, parts location.

(2) Connect the 411A across the AN/URM-48 output. Press the push-to-talk switch. Adjust the AN/URM-48 for a 100-millivolt indication on the 411A. (Note the db indication.)
(3) Disconnect the 411A from the AN/URM-48 and connect it between pins 3 and 4 of J1. The 411A should indicate 16 db more than the value indicated in (2) above. (This value, +16 db, is the stage gain.)
(4) Adjust the AN/URM-48 level to obtain a 0-db indication on the 411A.
(5) Increase the AN/URM-48 frequency until the 411A indicates a 3-db decrease.
(6) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Decrease the frequency of the AN/URM-48 to 30.00 mc.
(7) Connect the AN/URM-48 between pins 1 and 2 of J1.
(8) Decrease the frequency of the AN/URM-48 until the 411A indicates a 3-db decrease.
(9) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Increase the AN/URM-48 frequency to 30.00 mc.
(10) Compute the difference between the frequencies recorded in (6) and (9) above. The frequency difference is the 3-db bandwidth, which should be 1,300 kc.
(11) Adjust the AN/URM-48 frequency to 52.95 mc as indicated by the AN/USM-26.
(12) Repeat (1) through (10) above; return the AN/URM-48 to 52.95 mc instead of the indication given in ((6) and (9) above).
(13) The gain noted in (3) above should be +15 db; the 3-db bandwidth computed in the procedure given in (10) above should be 1,600 kc.
(14) Change the receiver-transmitter BAND switch to 53-75.
(15) Adjust the AN/URM-48 frequency to 53.00 mc as indicated by the AN/USM-26.
(16) Repeat the procedures given in (1) through (10) above, returning the AN/URM-48 to 53.00 mc instead of the indication given in ((6) and (9) above).
(17) The gain noted in (3) above should be +9.5 db; the 3-db bandwidth computed in (10) above should be 1,400 kc.
(18) Adjust the AN/URM-48 frequency to 75.95 mc as indicated by the AN/USM-26. Set the receiver-transmitter tuning knobs for the same frequency.
(19) Repeat the procedures given in (1) through (10) above; return the AN/URM-48 to 75.95 mc instead of the indication given in ((6) and (9) above).
(20) The gain noted in (3) above should be +10 db; the 3-db bandwidth computed in (10) above should be 2,800 kc.
(21) Replace module A8.
(22) If the gain and bandwidth do not meet the standards of the procedure, proceed to *c* below.

c. Faulty Parts Isolation.

(1) Remove module A8. Connect the H-138/U to an AUDIO connector. Apply a 30.00 mc, 100-millivolt signal between pins 1 and 2 of A7J1. Press the push-to-talk switch. Measure the voltages at the points outlined in the charts in *a* and *b* below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
J2	0.100
Q1 emitter	0.100
Q1 collector	1.45
Q1 base	0.100
J1-4	0.650

(b) Dc voltage chart.

Point of measurement	Volts (dc)
S1J1-2	-45
Q1 emitter	-37
Q1 base	-36
Q1 collector	0

(2) After the replacement of a faulty part, perform the alignment procedures given in *d* and *e* below, and repeat the procedures in *a* and *b* above.

d. Preparation for Alignment.

(1) Set the receiver-transmitter front panel controls as follows:
(a) BAND switch at 30-52.
(b) Function switch at ON.
(2) Connect the AN/URM-43A to ANT connector J2.
(3) Connect the H-138/U to an AUDIO connector.
(4) Remove module A8.
(5) Connect the AN/URM-48 between pins 1 and 2 of A7J1.

e. Alignment Procedure.

(1) Set the receiver-transmitter tuning knobs for 30.00 mc.
(2) Connect the 411A across the output of the AN/URM-48. Press the push-to-talk switch.
(3) Adjust the AN/URM-48 frequency to 30.00 mc and level to 100 millivolts, as indicated by the 411A.
(4) Disconnect the 411A from the AN/URM-48 and connect between pins 3 and 4 of J1.
(5) Adjust T3 for a peak indication on the 411A.
(6) Change the AN/URM-48 frequency and the receiver-transmitter tuning knobs to 52.95 mc.
(7) Adjust C9 for a peak indication on the 411A.
(8) Repeat the procedures given in (1) through (7) above until the 411A indication cannot be increased by tuning.
(9) Set the BAND switch on the receiver-transmitter to 53-75, and the tuning knobs to 53.00 mc.
(10) Disconnect the 411A from J1 and connect it across the AN/URM-48 output.
(11) Adjust the AN/URM-48 frequency to 53.00 mc and the level to 100 millivolts, as indicated by the 411A.
(12) Disconnect the 411A from the AN/URM-48 and connect it between pins 3 and 4 of A7J1.
(13) Adjust T2 for a peak indication on the 411A.
(14) Change the AN/URM-48 frequency and the receiver-transmitter tuning knobs for 75.95 mc.
(15) Adjust C6 for a peak indication on the 411A.
(16) Repeat the procedures given in (9) through (15) above until the 411A indication cannot be increased by tuning.
(17) Replace A8.

77. Isolating Trouble in Module A8 (fig. 11 and 60)

a. Preparation.

(1) Prepare the following equipment:
(a) Frequency Meter AN/USM-26.
(b) Signal Generator AN/URM-48.
(c) Rf Millivoltmeter 411A.
(d) Handset H-138/U.
(e) Rf Wattmeter AN/URM-43A.
(f) Multimeter ME-26B/U.
(2) Connect the H-138/U to an AUDIO connector.
(3) Connect AN/URM-43A to ANT connector J2.
(4) Set the front panel controls of the receiver-transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs for 30.00 mc.
(c) Function switch at ON.
(5) Remove module A9.
(6) Connect the AN/URM-48 output to the input of the AN/USM-26. Adjust AN/URM-48 for 30.000 mc, as indicated by the AN/USM-26.

b. Gain and Bandwidth Test.

(1) Connect the output of the AN/URM-48 between pins 1 and 2 of A8J1.
(2) Connect the 411A across the AN/URM-48 output. Press the push-to-talk switch. Adjust the AN/URM-48 for a 100-millivolt indication on the 411A. Note the db indication.
(3) Disconnect the 411A from the AN/URM-48 and connect it between pins 3 and 4 of A8J1. The 411A should indicate 19 db more than the value indicated in (2) above. (This value, +19 db, is the stage gain.)
(4) Adjust the AN/URM-48 level to ob-

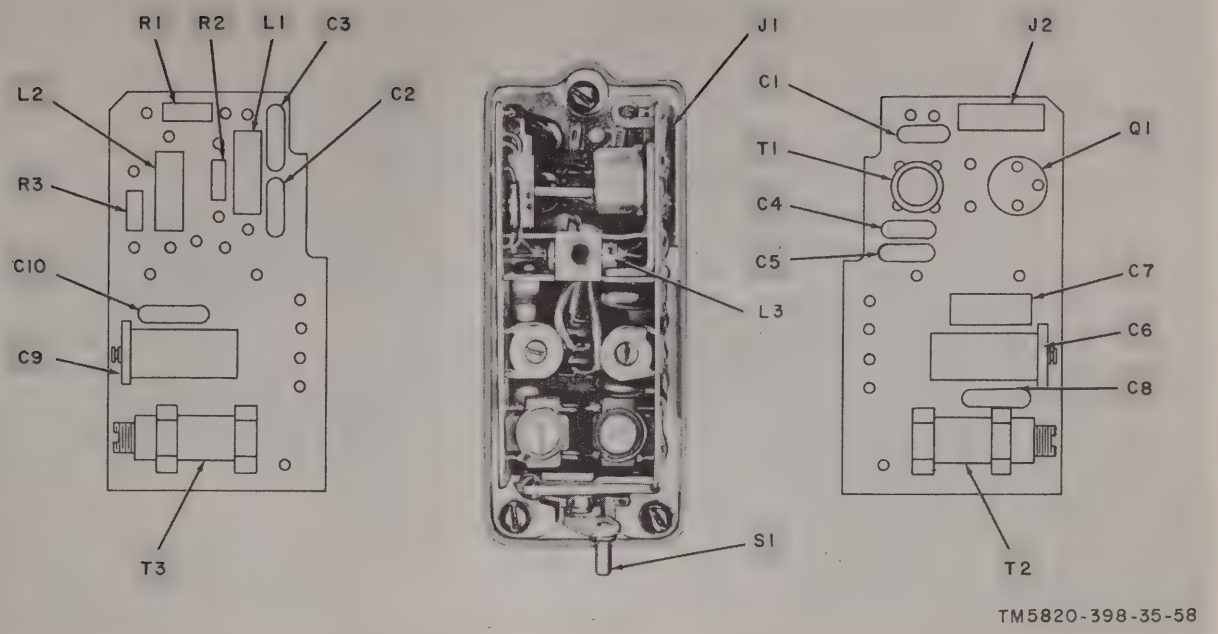


Figure 59. Module A7, parts location.

tain a 0-db indication on the 411A.

(5) Increase the AN/URM-48 frequency until the 411A indicates a 3-db decrease.

(6) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Decrease the AN/URM-48 to 30.00 mc.

(7) Connect the AN/URM-48 between pins 1 and 2 of A8J1.

(8) Decrease frequency of the AN/URM-48 until the 411A indicates a 3-db decrease.

(9) Connect the AN/URM-48 to the AN/USM-26 and record the frequency. Increase the AN/URM-48 frequency to 30.00 mc.

(10) Compute the difference between the frequencies recorded in (6) and (9) above. The frequency difference is the 3-db bandwidth, which should be 600 kc.

(11) Adjust the AN/URM-48 frequency to 52.95 mc as indicated by the AN/USM-26.

(12) Repeat the procedures given in (1) through (10) above; return the AN/URM-48 to 52.95 mc instead of the indication given in (6) and (9) above.

(13) The gain noted in (3) should be +20 db; the 3-db bandwidth computed in (10) above should be 1,100 kc.

(14) Change the receiver-transmitter BAND switch to 53-75.

(15) Adjust AN/URM-48 frequency to 53.00 mc as indicated by the AN/USM-26.

(16) Repeat (1) through (10) above; return the AN/URM-48 to 53.00 mc instead of the indication given in (6) and (9) above.

(17) The gain noted in (3) above should be +18 db; the 3-db bandwidth computed in (10) above should be 500 kc.

(18) Adjust the AN/URM-48 frequency to 75.95 mc as indicated by the AN/USM-26.

(19) Repeat the procedures given in (1) through (10) above, returning the AN/URM-48 to 75.95 mc instead of the indication given in (6) and (9) above.

(20) The gain noted in (3) above should be +20 db; the 3-db bandwidth computed in (10) should be 1,500 kc.

(21) Replace module A9.

(22) If the gain and bandwidth do not meet the standards of the procedure, proceed to *c* below.

c. Faulty Parts Isolation.

(1) Remove module A9. Connect the H-138/U to an AUDIO connector. Apply a 30.00 mc, 100-millivolt signal between pins 1 and 2 of A8J1. Press the push-to-talk switch. Measure the voltages at the points given in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
J2	100
Q1 base	180
Q1 collector	980
J1-4	720

(b) Dc voltage chart.

Point of measurement	Volts (dc)
S1J1-2	10
Q1 base	7.2
Q1 emitter	7.3

(2) After the replacement of a faulty part, perform the alignment procedures outlined in *d* and *e* below and repeat *a* and *b* above.

d. Preparation for Alignment.

(1) Set the receiver-transmitter front panel controls as follows:
(a) BAND switch at 30-52.
(b) Function switch at ON.
(2) Connect the AN/URM-43A to ANT connector J2.
(3) Connect the H-138/U to an AUDIO connector.
(4) Remove module A9.
(5) Connect the AN/URM-48 between pins 1 and 2 of A8J1.

e. Alignment Procedure.

(1) Set the receiver-transmitter tuning knobs to 30.00 mc.
(2) Connect the 411A across the output of the AN/URM-48. Press the push-to-talk switch.
(3) Adjust the AN/URM-48 frequency to 30.00 mc and the level to 100 millivolts, as indicated by the 411A.
(4) Disconnect the 411A from the AN/URM-48 and connect it between pins 3 and 4 of J1.
(5) Adjust T2 for a peak indication on the 411A.
(6) Change the AN/URM-48 frequency and the receiver-transmitter tuning knobs to 52.95 mc.
(7) Adjust C6 for a peak indication on the 411A.
(8) Repeat the procedures given in (1) through (7) above until the 411A indication cannot be increased by tuning.
(9) Set the BAND switch on the receiver-transmitter at 53-75, and the tuning knobs for 53.00 mc.
(10) Disconnect the 411A from pins 3 and 4 of A8J1 and connect it across the AN/URM-48 output.
(11) Adjust the AN/URM-48 frequency to 53.00 mc and the level to 100 millivolts, as indicated by the 411A.
(12) Disconnect the 411A from the AN/URM-48 and connect it between pins 3 and 4 of A8J1.
(13) Adjust T3 for a peak indication on the 411A.
(14) Change the AN/URM-48 frequency and the receiver-transmitter tuning knobs to 75.95 mc.
(15) Adjust C9 for a peak indication on the 411A.
(16) Repeat the procedures given in (9) through (15) above until the 411A indication cannot be increased by tuning.
(17) Replace A9.

78. Isolating Trouble in Module A9 (fig. 10 and 61)

a. Preparation.

(1) Prepare the following equipment:
(a) Frequency Meter AN/USM-26.
(b) RF Millivoltmeter 411A.
(c) Multimeter ME-26B/U.
(d) Handset H-138/U.
(2) Connect the AN/USM-26 input to test point A14J2.

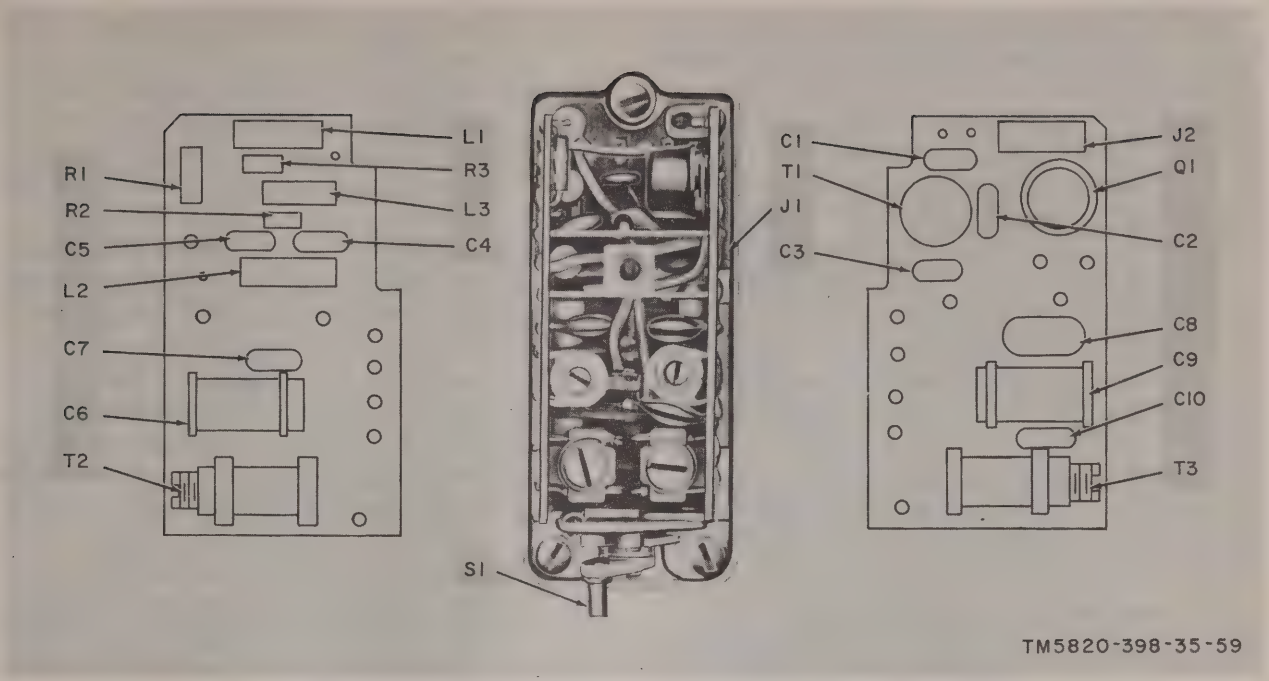


Figure 60. Module A8, parts location.

(3) Connect the ME-26B/U to A9J3.
(4) Connect the 411A to A9J4.
(5) Set the receiver-transmitter front panel controls as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs for 30.50 mc.
(c) Function switch at ON.

b. Vfo Frequency Test.

(1) While rotating the mc tuning knob in 1-mc increments from 30.50 to 52.50 mc, observe the indications on the ME-26B/U, the AN/USM-26, and the 411A.
(2) A normal apc voltage indicated throughout the tuning range by the ME-26B/U is +3.6 volts dc ±0.5.
(3) Normal frequency indications obtained on the AN/USM-26 when tuning through the 30.50- to 52.50-mc range are 42.000 mc ±2 kc to 64.000 mc ±2 kc. Each point of observation should differ by 1 mc ±25 cps.
(4) A normal vfo rf output level indicated throughout the tuning range by the 411A is 0.40 volt ±1.5 db.
(5) Disconnect the 411A from A9J4 and connect it to A5J2. Check the injection level into A5 while rotating the mc tuning knob through the 30.50 to 52.50 mc tuning range. A normal rf level indicated by the 411A is 0.060 volt ±3 db.
(6) Disconnect the 411A from A5J2 and connect it to A14J2. Check the injection level into A14 while rotating the mc tuning knob through the 30.50 to 52.50 mc tuning range. A normal rf level indicated by the 411A is 0.40 volt ±1.5 db.
(7) Disconnect the 411A from A14J2 and connect it to A8J2. Connect the H-138/U to AUDIO connector and press the push-to-talk switch. Check the injection level into A8 while rotating the mc tuning knob through the 30.50 to 52.50 mc tuning range. A normal indication on the 411A is 1.3 volts ±2 db.
(8) Remove module A14. Disconnect the 411A from A8J2 and connect it to pin A of J20 (receptacle for A14). Check the rf signal level while rotating the mc tuning knob through the 30.50 to 52.50 mc tuning range. A normal indication on the 411A is 0.60 volt ±2 db.

(9) Disconnect the 411A from J20. Replace A14. Connect the 411A to A9J4.
(10) Set the receiver-transmitter BAND switch to 53-75.
(11) While rotating the receiver-transmitter mc tuning knob in 1-mc increments from 53.50 to 75.50 mc, observe the indications on the ME-26B/U and the 411A.
(12) The ME-26B/U indication should be the same as that in (2) above; the 411A indication should be the same as that in (4) above.
(13) If any of the indications obtained above are not normal, proceed to the alignment procedure given in *c* and *d* below.

c. Preparation for Alignment.

(1) Prepare the following equipment:
(a) Transistor Power Supply 721A.
(b) Frequency Meter AN/USM-26.
(c) Multimeter ME-26B/U.
(d) Rf Wattmeter AN/URM-43A.
(2) Connect the positive lead of the 721A to A9J3. Connect the GRD lead to the receiver-transmitter chassis.
(3) Connect the AN/URM-43A to ANT connector J2.
(4) Connect the ME-26B/U across the 721A output. Adjust the 721A until the ME-26B/U indicates exactly 3.6 volts dc.
(5) Connect the AN/USM-26 to A14J2.
(6) Set the receiver-transmitter front panel controls as follows:
(a) BAND switch at 30-52.
(b) Mc and kc tuning knobs for 30.50 mc.
(c) Function switch at ON.

d. Alignment Procedure.

(1) Rotate the mc tuning knob to 31.50 mc. Adjust T1 until the AN/USM-26 indicates 43.000 mc ±25 kc.
(2) Rotate the mc tuning knob to 51.50 mc. Adjust C9 until AN/USM-26 indicates 63.000 mc ±25 kc.
(3) Repeat the procedure given in (1) and (2) above until no further adjustment is necessary.
(4) Reset the mc tuning knob to 31.50 mc (AN/USM-26 indicates 43.000 mc ±25 kc).
(5) Adjust the 721A output voltage until the ME-26B/U indicates exactly +4.0 volts dc. Record the frequency indicated by the AN/USM-26.
(6) Adjust the 721A output voltage until the ME-26B/U indicates exactly +3.0 volts dc. Record the frequency indicated by the AN/USM-26.
(7) Subtract the indication obtained in (6) above from that obtained in (5) above. This value, which is the vfo sensitivity (kc/volt), at the lower end of the band, should be 300 kc ±30.
(8) Reset the mc tuning knob to 51.50 mc and the 721A output (indicated by the ME-26B/U) to +3.6 volts dc. The AN/USM-26 should indicate 63.000 mc ±25 kc.
(9) Adjust the 721A output voltage until the ME-26B/U indicates exactly +4.0 volts dc. Record the frequency indicated by the AN/USM-26.
(10) Adjust the 721A output voltage until the ME-26B/U indicates exactly +3.0 volts dc. Record the frequency indicated by the AN/USM-26.
(11) Subtract the indication obtained in (10) above from that obtained in (9) above. This value, which is the vfo sensitivity at the upper end of the band, should be equal to the indication obtained in (7) above within ±15 kc.
(12) Reset the 721A output voltage to exactly -3.6 volts dc as indicated by the ME-26B/U.
(13) If the indications obtained in the procedures given in (7) and (11) above are within limits, proceed to (17) below. If the indications are greater than ±15 kc apart, proceed to (14) below.
(14) If the frequency difference given in (11) above is less than that given in (7) above, adjust C8 clockwise until the vfo frequency is decreased 50 kc, as indicated by the AN/USM-26. Adjust C9 counterclockwise until the vfo frequency is increased

50 kc, as indicated by the AN/USM-26.

(15) If the frequency difference given in (11) above is greater than that given in (7) above, adjust C8 counterclockwise until the vfo frequency is increased by 50 kc, as indicated by the AN/USM-26. Adjust C9 clockwise until the vfo frequency is returned to its nominal value, 63.000 mc, as indicated by the AN/USM-26.

(16) Repeat the procedures given in (1) through (11) above. If necessary, repeat the procedure given in (14) or (15) above and the entire alignment procedure until the results obtained in the procedures given in (7) and (11) above are within the prescribed limits.

(17) Reduce the 721A output to zero and disconnect it from A9J3. (Allow the ME-26B/U to remain connected to A9J3.)

(18) Press switches S2 and S3 (fig. 31) and note the apc closed-loop voltage as indicated by the ME-26B/U. A normal indication is +3.6 volts dc ±0.2.

(19) Release S2 and S3. Rotate the mc tuning knob from 30.50 mc to 52.50 mc in 1-mc steps and record the apc voltage (indicated by the ME-26B/U) at each step. The normal voltage deviation, relative to the indication obtained in the procedure given in (18) above, is approximately ±0.5 volt.

(20) If the indications obtained above are not normal, proceed to *e* below.

(21) If the indications obtained above are normal, alignment procedures for A9 are completed.

e. Faulty Part Isolation.

(1) Remove modules A8 and A20.

(2) Apply an 11.5-mc, 0.68-volt signal between pin 1 of A9J1 and chassis ground.

(3) Use an ME-26B/U to measure dc voltages at the points listed in the chart below. Compare them with the typical voltages listed.

Note: Measure all voltages to ground.

Point of measurement	Volts (dc)
Q1 base	7.5
Q1 collector	0
Q1 emitter	7.7
Q2 base[a]	6.0
Q2 collector[a]	0
Q2 emitter[a]	6.0
Q3 base	5.8
Q3 collector	0
Q3 emitter	7.6

[a] For this measurement connect a jumper wire between pins 5 and 6 of connector J6 (receptacle for module A8) and press the push-to-talk switch.

(4) After the replacement of a faulty part, replace the module cover and perform the alignment procedures given in *d* above.

79. Isolating Trouble in Module A10 (fig. 19 and 62)

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Frequency Meter, AN/USM-26.
- *(b)* Voltmeter, Meter ME-30A/U.
- *(c)* Rf Millivoltmeter 411A.
- *(d)* Handset H-138/U.
- *(e)* Resistor, 470-ohm, 1-watt.
- *(f)* Multimeter ME-26B/U.
- *(g)* Rf Wattmeter AN/URM-43A.

(2) Set the receiver-transmitter front panel controls as follows:
- *(a)* BAND switch at 30-52.
- *(b)* Tuning knobs for 30.00 mc.
- *(c)* Function switch at ON.

(3) Connect the AN/URM-43A to ANT connector J2.

b. 100-Kc Interval Oscillator Test.

(1) Connect the AN/USM-26, in series with the 470-ohm resistor, between test point A10J2 and ground. The AN/USM-26 should indicate 46.850 mc.

(2) Connect the 411A between A10J2 and ground. The 411A should indicate 0.2 volt.

(3) Set the receiver-transmitter tuning knobs for 30.10 mc. The AN/USM-26 should indicate 46.950 mc; the 411A should indicate 0.2 volt.

(4) Set the tuning knobs for 30.20 mc. The AN/USM-26 should indicate

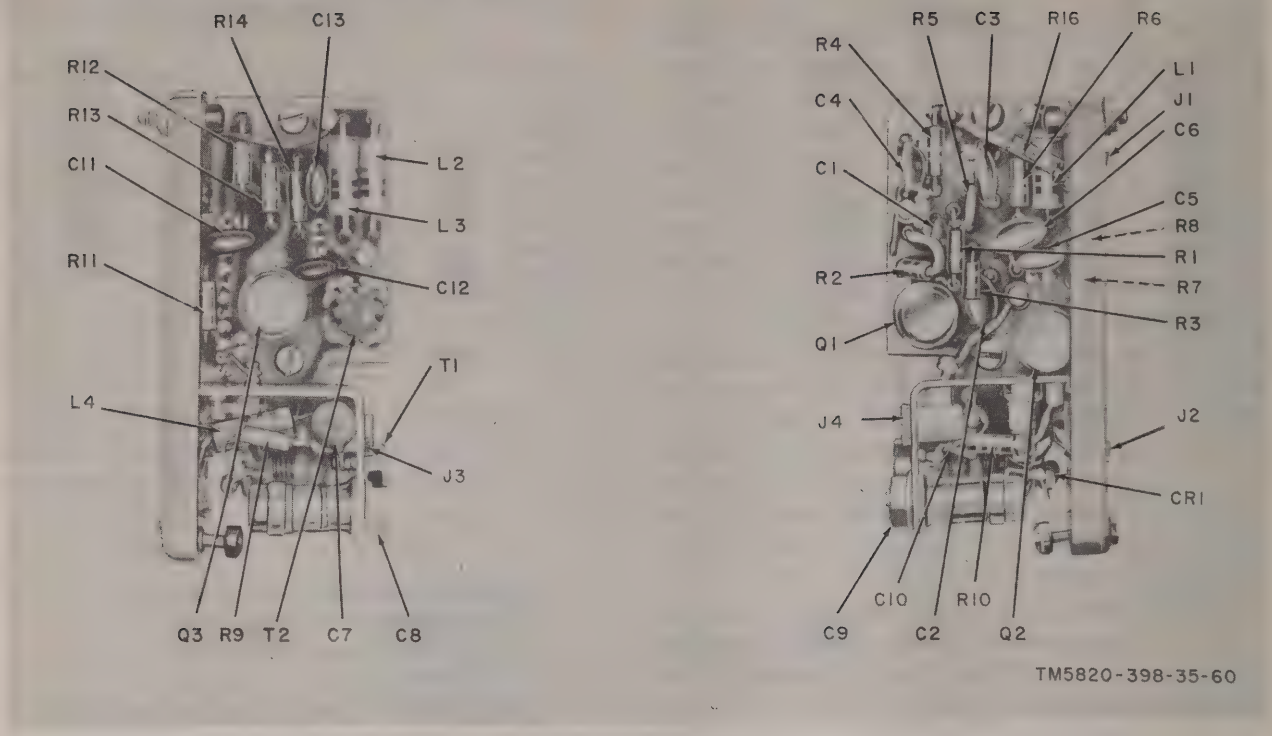


Figure 61. Module A9, parts location.

47.050; the 411A should indicate 0.2 volt.

(5) Set the tuning knobs for 30.30 mc. The AN/USM-26 should indicate 47.150 mc; the 411A should indicate 0.2 volt.

(6) Set the tuning knobs for 30.40 mc. The AN/USM-26 should indicate 47.250 mc; the 411A should indicate 0.2 volt.

(7) Set the tuning knobs for 30.50 mc. The AN/USM-26 should indicate 47.350 mc; the 411A should indicate 0.2 volt.

(8) Set the tuning knobs for 30.60 mc. The AN/USM-26 should indicate 47.450 mc; the 411A should indicate 0.2 volt.

(9) Set the tuning knobs for 30.70 mc. The AN/USM-26 should indicate 47.550 mc; the 411A should indicate 0.2 volt.

(10) Set the tuning knobs for 30.80 mc. The AN/USM-26 should indicate 47.650 mc; the 411A should indicate 0.2 volt.

(11) Set the tuning knobs for 30.90 mc. The AN/USM-26 should indicate 47.750 mc; the 411A should indicate 0.2 volt.

c. 50-Kc Interval Oscillator Test.

(1) Remove the cover from A10; remove modules A11, A12, and A17.

(2) Set the BAND switch on the receiver-transmitter at 30-52 mc, and set the tuning knobs for 30.00 mc.

(3) Connect a jumper between pins C and D of connector J13 (receptacle for A17).

(4) Connect the AN/USM-26 between test point A10J3 and ground. The AN/USM-26 should indicate 5.6500 mc.

(5) Disconnect the AN/USM-26 from A10J3 and connect the 411A between A10J3 and ground. The 411A should indicate 1.8 volts rms.

(6) Set the tuning knobs for 30.05 mc. The 411A should indicate 1.8 volts rms. Disconnect the 411A from

A10J3 and reconnect the AN/USM-26. The AN/USM-26 should indicate 5.6000 mc.

(7) Connect the H-138/U to an AUDIO connector and press the push-to-talk switch. The AN/USM-26 should indicate 5.5500 mc.

(8) Set the tuning knobs for 30.00 mc and press the push-to-talk switch. The AN/USM-26 should indicate 5.6000 mc.

(9) Disconnect the AN/USM-26 from A10J3 and reconnect the 411A. Press the push-to-talk switch. The 411A should indicate 1.8 volts rms.

(10) Set the tuning knobs for 30.05 mc and press the push-to-talk switch. The 411A should indicate 1.8 volts rms.

d. Faulty Parts Isolation.

(1) Set the tuning knobs for 30.00 mc. Measure the voltages at the points outlined below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
Q1 base	0.3
Q1 collector	5.0
Q2 emitter	0.3
Q2 base	0.4
R5-CR1 junction (in receive)	5.1
(in transmit)	1.5
R7-CR2 junction (in receive)	0.0
(in transmit)	5.1
Q2 collector	4.6
Q3 base	0.3
Q3 collector	5.0

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	7.0
Q1 collector	0.0
Q1 emitter	7.2
Q2 base	8.0
Q2 collector	2.5
Q2 emitter	8.2
Q3 base	7.0
Q3 collector	0.0
Q3 emitter	7.2

(2) After the replacement of a faulty part, perform the alignment procedure given in *e*, *f*, and *g* below, and repeat the procedures given in *a*, *b*, and *c* above.

(3) Replace A11, A12, and A17. Replace the cover on A10.

e. Preparation for Alignment.

(1) Prepare the AN/USM-26 and the 411A.

(2) Set the receiver-transmitter controls as follows:

(a) BAND switch to 30-52.

(b) Function switch to ON.

f. 100-Kc Interval Oscillator Alignment.

(1) Set the receiver-transmitter tuning knobs to 30.50 mc.

(2) Connect the AN/USM-26, in series with the 470-ohm resistor, to A10J2.

(3) Adjust T1 until the AN/USM-26 indicates 47.350 mc.

g. 50-Kc Interval Oscillator Alignment.

(1) Remove the cover from A10. Remove A11, A12, A17, A18 from the mother-board.

(2) Set the tuning knobs to 30.05 mc.

(3) Connect a jumper between pins C and D of connector J13 (receptacle for A17).

(4) Connect the AN/USM-26 to A10J3.

(5) Adjust T2 until the AN/USM-26 indicates 5.6000 mc.

(6) Disconnect the AN/USM-26 and connect the 411A to A10J3.

(7) Adjust T3 for peak indication on the 411A.

(8) Replace modules A11, A12, A17 and A18.

80. Isolating Trouble in Module A11

(fig. 24 and 63)

a. Preparation.

(1) Prepare the following equipment:

(a) Frequency Meter AN/USM-26.

(b) Rf Millivoltmeter 411A.

(c) Signal Generator AN/URM-48.

(d) Multimeter ME-26B/U.

(e) Module extender.

(2) Remove A11. Insert the module extender into the receptacle for A11. Remove the cover from A11 and plug A11 into the module extender. Remove A12 from the mother board.

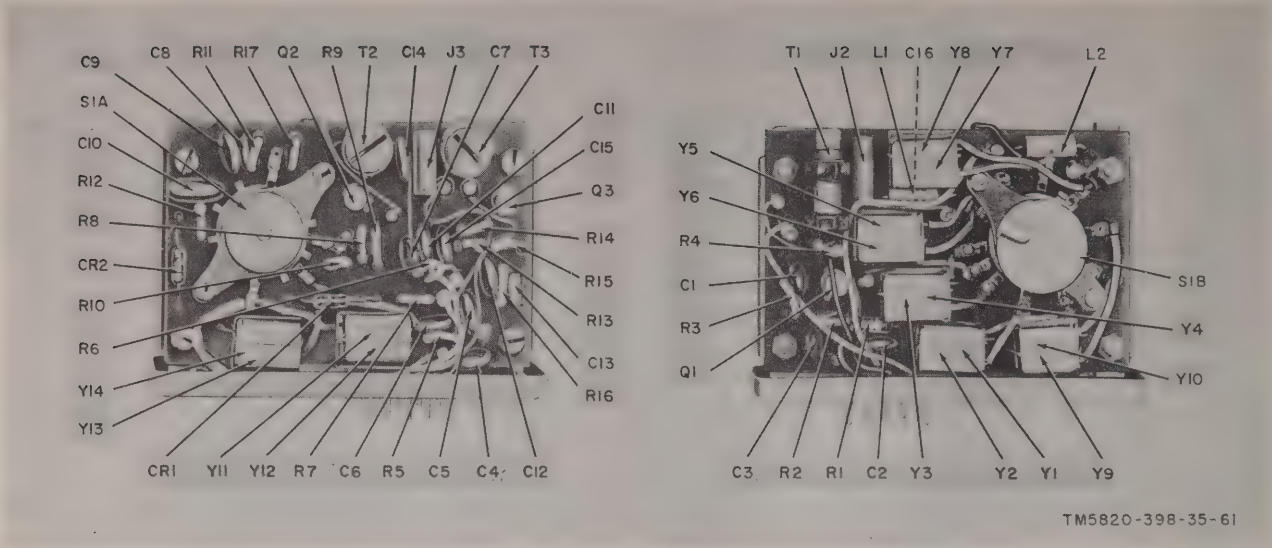


Figure 62. Module A10, parts location.

(3) Turn the receiver-transmitter function switch to ON.

b. Dc Output Level Test.

(1) Connect the AN/URM-48 between A18J2 and chassis ground. Connect the AN/USM-26 and the 411A across the AN/URM-48 output.

(2) Press S2 (fig. 31) and adjust the AN/URM-48 frequency to the level to 0.2-volt as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-48 and connect it between pin F of A11J1 and ground.

(4) Connect the ME-26B/U between A11J2 and chassis ground. The ME-26B/U should indicate +2.8 volts dc.

c. Faulty Parts Isolation.

(1) Apply a 5.6-mc, 0.2-volt signal between A18J2 and chassis ground. Measure the voltages at the points outlined in the charts in *a* and *b* below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
J2	1.3
Q1 base	0.2
Q1 collector	2.8
Q1 emitter	0.0

(b) Dc voltage chart.

Point of measurement	Voltage (dc)
J1 pin D	10.0
Q1 base	8.0
Q1 collector	3.0
Q1 emitter	8.2
J2	2.8

(2) After the replacement of a faulty part, perform the alignment procedure given in *d* and *e* below and repeat the procedures given in *a* and *b* above.

(3) Replace module A12.

d. Preparation for Alignment.

(1) Set the receiver-transmitter front panel controls as follows:

(a) BAND switch at 30-52.

(b) Tuning knobs to 30.00 mc.

(c) Function switch at ON.

(2) Remove A11. Insert the module extender into the receptacle for A11. Plug A11 into the module extender. Remove module A12.

(3) Connect the output of the AN/URM-48 to A18J2. Connect the 411A across the AN/URM-48 output.

(4) Set the AN/URM-48 output to 6.10 mc and adjust the output level to 0.2 volt as indicated by the 411A.

e. Alignment Procedure.

(1) Connect the ME-26B/U between A11J2 and chassis ground.

(2) Adjust transformer T1 for a maximum dc indication on the ME-26B/U.
(3) Set the output of the AN/URM-48 to 5.20 mc.
(4) Adjust transformer T2 for a minimum indication on the ME-26B/U.
(5) Set the output of the AN/URM-48 to 5.60 mc. Adjust T1 until the ME-26B/U indicates +2.8 volts dc.
(6) Replace module A12.

81. Isolating Trouble in Module A12 (fig. 21 and 64)

a. Preparation.
(1) Prepare the following equipment:
(a) Rf Millivoltmeter 411A.
(b) R. F. Signal Generator AN/URM-25F.
(c) Frequency Meter AN/USM-26.
(d) Multimeter ME-26B/U.
(e) Module extender.
(2) Remove A12 and A13. Insert the module extender into the receptacle for A12. Plug A12 into the module extender.

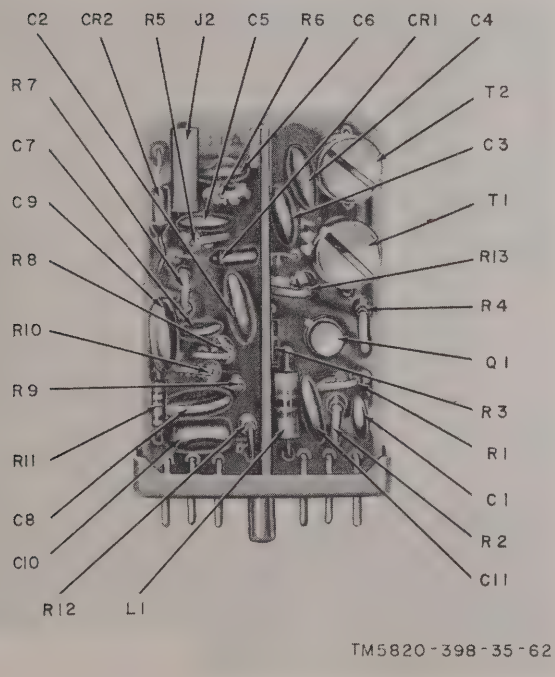


Figure 63. Module A11, parts location.

(3) Connect a jumper between pin A and C of A12J1.
(4) Set the front panel controls of the receiver-transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs to 30.00 mc.
(c) Function switch at ON.

b. Gain Test.
(1) Connect the AN/URM-25F between pin B of A12J1 and ground. Connect the 411A and the AN/USM-26 across the AN/URM-25 output.
(2) Adjust the AN/URM-25F frequency to 5.60 mc and the output level to 10 millivolts, as indicated by the 411A.
(3) Connect the 411A between A12J2 and ground. The 411A should indicate approximately 100 millivolts.
(4) If the gain does not meet the standards of the procedure given above, proceed to *d* below.
(5) If the gain meets the standards given above, proceed to *c* below. Do not disturb the equipment setings.

c. Bandwidth Test.
(1) With the AN/URM-25F adjusted as in *a* above, note the output level indicated by the 411A.
(2) Adjust the AN/URM-25F frequency to 5.25 mc and maintain the output level at 10 millivolts. Note the indication on 411A.
(3) Adjust the AN/URM-25F frequency to 6.10 mc and maintain the output level at 10 millivolts. Note the indication on 411A.
(4) The indication obtained in the procedure given in (2) and (3) above should be 6 db less than the response indicated in (1) above.

d. Faulty Parts Isolation.
(1) Apply a 5.60 mc, 10-mv signal between pin B of A12J1 and ground. Measure the voltages at the points outlined in the charts in (*a*) and (*b*) below. Compare the normal signals and the dc voltages listed in the charts.

Note: Connect a jumper between pins A and C of A12J1 for the measurements listed below.

(a) Signal voltage chart.

Point of measurement	Volts (rms)
Q1 base	0.008
Q1 emitter	0.0
Q1 collector	0.80
J2	0.10

(b) Dc voltage chart.

Point of measurement	Voltage (dc)
J1-D	10.0
Q1 base	4.2
Q1 collector	0.0
Q1 emitter	4.5

(2) After the replacement of a faulty part, perform the alignment procedures given in paragraph 86 and repeat the procedures given in *a*, *b*, and *c* above. Replace module A13. Remove the module extender.

e. Preparation for Alignment.

(1) Be sure to perform the preparation procedures given in *a* above.

(2) Connect the AN/URM-25F between pin B of A12J1 and chassis ground. Connect the 411A and the AN/USM-26 across the AN/URM-25 output.

(3) Adjust the AN/URM-25F frequency to 5.60 mc and the output level to 10 millivolts as indicated by the 411A.

(4) Connect the 411A between A12J2 and ground.

f. Alignment Procedure. To align module A12, alternately adjust T1, L1, T2, and L2 for a maximum indication on the 411A.

82. Isolating Trouble in Module A13 (fig. 20 and 65)

a. Preparation.

(1) Prepare the following equipment:
(a) Signal Generator AN/URM-48.
(b) Frequency Meter AN/USM-26.
(c) Rf Millivoltmeter 411A.

(2) Turn the receiver-transmitter function switch to ON.

b. 53-Mc Filter Test.

(1) Remove module A9 and connect the AN/URM-48 between pin 1 of J6 (receptacle for A9) and chassis ground.

(2) Connect the AN/USM-26 and the 411A across the AN/URM-48 output. Adjust the AN/URM-48 frequency to 46.500 mc as indicated by the AN/USM-26; set the output level to 3 millivolts as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-48 and connect it between A18J2 and chassis ground.

(4) Set the receiver-transmitter tuning knobs to 30.00 mc.

(5) Record the voltage level at A18J2 as indicated by the 411A. This level should be approximately 40 millivolts.

(6) Adjust the AN/URM-48 frequency to 47.400 mc as indicated by the AN/USM-26. (Maintain the 3-millivot output level.)

(7) Set the receiver-transmitter tuning knobs to 30.90 mc.

(8) Record the voltage level at A18J2 as indicated by the 411A.

(9) If the indication obtained in the

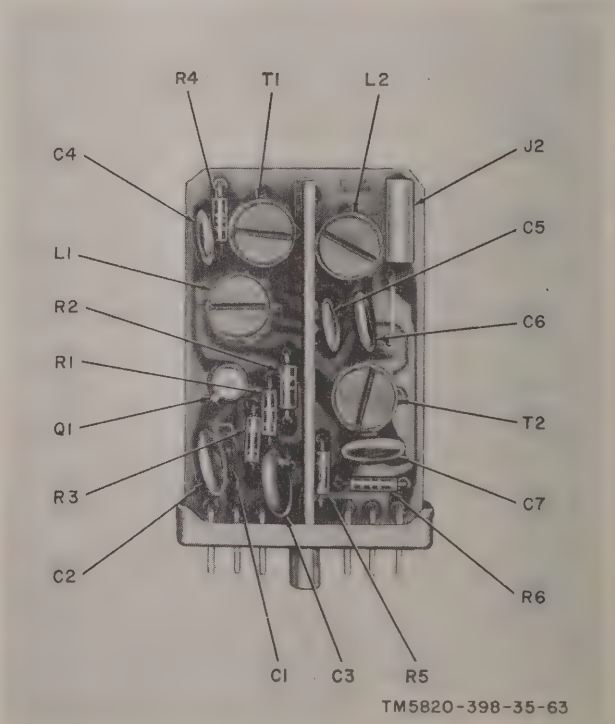


Figure 64. Module A12, parts location.

procedure given in (8) above differs from that indicated in (5) above by more than 2 db, proceed to the alignment procedures in *c* below.

(10) If the indications obtained in the procedure given in (5) and (8) above are normal, testing of A13 is completed.

c. Faulty Parts Isolation. Insert the module extender (fig. 27) into the A13 connector on the mother board. Insert A13 into the module extender. Apply a 10-millivolt rf signal of the frequency indicated in the chart in (1) below and measure the voltages across the parts indicated. Compare them with the normal signal levels listed. Press switch S3 for these measurements.

Note: Measure all voltages to ground.

(1) *Signal voltage chart.*

Injection		Point of measurement	Voltage (mv rms)
Frequency (mc)	Location		
51.9	J1 pins E and F	Across secondary of T1 ----------	55
51.2	J1 pins E and F	Across T2 ----------	8
50.1	J1 pins E and F	Across L1 ----------	25
46.5	J1 pins C and D	Across T3 ----------	7

(2) After the replacement of a faulty part, repeat the procedures given in *a* and *b* above.

d. 53-Mc Filter Alignment.

(1) Remove module A15.

(2) Set the receiver-transmitter tuning knobs for 30.50 mc.

(3) Connect the 411A across the AN/URM-48 output.

(4) Adjust the AN/URM-48 frequency to 53.000 mc, as indicated by the AN/USM-26, and the level to 20 millivolts, as indicated by 411A.

(5) Disconnect the 411A from the AN/URM-48 and connect it between A12J2 and chassis ground.

(6) Adjust L1, T2, and T3 for a peak indication on the 411A. A typical indication is about 100 millivolts.

(7) Disconnect the 411A from A12J2 and connect it across the AN/URM-48 output.

(8) Adjust the AN/URM-48 frequency to 52.500, as indicated by the AN/USM-26, and set the level to 20 millivolts, as indicated by the 411A.

(9) Disconnect the 411A from the AN/URM-48 and connect it between A12J2 and chassis ground.

(10) Set the receiver-transmitter tuning knobs for 30.00 mc. Record the level at A12J2 as indicated by the 411A.

(11) Adjust the AN/URM-48 frequency to 53.400 mc, as indicated by the AN/USM-26.

(12) Set the receiver-transmitter tuning knobs for 30.90 mc. Record the the level at A12J2 as indicated by the 411A.

(13) If the levels recorded in (10) and (12) are not equal, ±2 db, repeat the procedures given in (8) through (12) above while adjusting T1.

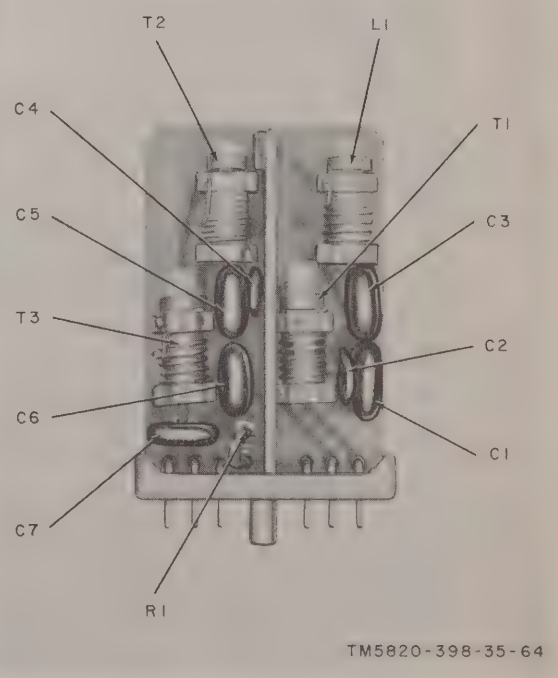


Figure 65. Module A13, parts location.

83. Isolating Trouble in Module A14 (fig. 17 and 66)

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Signal Generator AN/URM-48.
- *(b)* Frequency Meter AN/USM-26.
- *(c)* RF Millivoltmeter 411A.
- *(d)* Oscilloscope AN/USM-50A.
- *(e)* Multimeter ME-26B/U.
- *(f)* Module extender.

(2) Remove module A9.

(3) Turn the receiver-transmitter function switch to ON.

b. VFO Input Test.

(1) Connect the AN/URM-48 between pin 1 of J2 (receptacle for A9) and chassis ground. Connect the 411A across the AN/URM-48 output.

(2) Adjust the AN/URM-48 frequency to 53 mc and set the level to 10 millivolts, as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-48 and connect it between A14J2 and chassis ground.

(4) Slowly vary the AN/URM-48 frequency from 41 to 65 mc while observing the 411A.

(5) The 411A should indicate 25 millivolts ±2 db throughout the 41- to 65-mc tuned range.

c. 1-Mc Input Test.

(1) Connect the AN/USM-26 between A14J3 and ground. The frequency meter should indicate 1 mc ±25 cps.

(2) Connect the AN/USM-50A between A14J3 and ground. The AN/USM-50A should indicate 1.5 volts peak-to-peak.

d. Faulty Parts Isolation.

(1) Insert the module extender into the A14 connector and insert A14 into the module extender. Remove the cover from A14.

(2) Apply a 53-mc, 0.01-volt signal between pin A of A14J1 and chassis ground. Measure the voltages at the points listed below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
Q1 base	0.0045
Q1 collector	0.08

(b) Dc voltage chart.

Point of measurement	Voltage (dc)
J1 pin B	10.0
Q1 emitter	6.2
Q1 base	6.0

(3) After the replacement of a faulty part, perform the alignment procedure outlined in *e* and *f* below and repeat the procedures given in *a*, *b*, and *c* above. Replace module A9.

e. Prepration for Alignment.

(1) Set the receiver-transmitter front panel controls as follows:
- *(a)* BAND switch at 30-52.
- *(b)* Tuning knobs to 30.50 mc.
- *(c)* Function switch at ON.

(2) Remove module A9.

f. Alignment Procedures.

(1) Connect the AN/URM-48 between pin 1 of J6 (receptacle for A9) and chassis ground. Connect the 411A across the AN/URM-48 output.

(2) Adjust the AN/URM-48 frequency to 52 mc and the level to 3 millivolts, as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-48 and connect it between A18J2 and chassis ground.

(4) Record the voltage level at A18J2 as indicated by the 411A.

(5) Adjust the AN/URM-48 frequency to 54 mc (maintain the output level at 3 millivolts).

(6) Record the voltage level at A18J2 as indicated by the 411A.

(7) Compare the indications obtained in the procedures given in (4) and (6) above. If the indications are equal to each other, alignment of A14 is accurate. If the indications are not equal to each other, proceed to (8) below.

(8) Repeat the procedures given in (1)

through (7) above and adjust T2 until the indications given in (4) and (6) above are equal. Perform this step as required.

(9) Replace module A9.

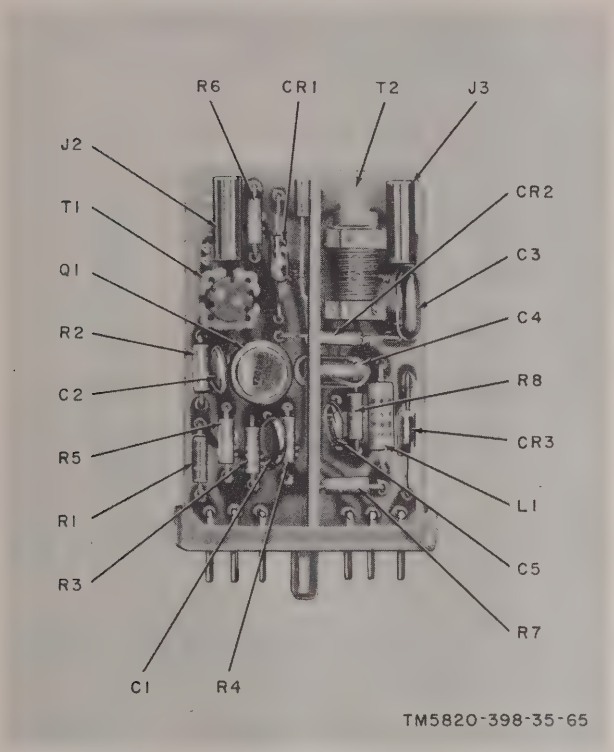


Figure 66. Module A14, parts location.

84. Isolating Trouble in Module A15 (fig. 18 and 67)

a. Preparation.

(1) Prepare the following equipment:
- *(a)* Frequency Meter AN/USM-26.
- *(b)* Voltmeter, Meter ME-30A/U.
- *(c)* Oscilloscope AN/USM-50A.
- *(d)* Multimeter ME-26B/U.
- *(e)* Module extender.

(2) Set the receiver-transmitter front panel controls as follows:
- *(a)* BAND switch at 30-52.
- *(b)* Tuning knobs to 30.00 mc.
- *(c)* Function switch at ON.

b. Output Frequency and Output Level Test. Connect the AN/USM-26 between A14J3 and chassis ground. The AN/USM-50A should indicate a minimum of 1.5 volts peak-to-peak.

c. Faulty Parts Isolation.

(1) Insert the module extender into the A15 connector and insert A15 into the module extender.

(2) Place the function switch on the receiver-tansmitter at ON. Measure the voltages at the points outlined in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Voltage (rms)
Q1 base	0.01
Q1 emitter	0.5
Q1 collector	5.3
Q2 base	1.8
Q2 collector	4.3
J1-E	4.3

(b) Dc voltage chart.

Point of measurement	Voltage (dc)
J1 pin A	10.0
L1 - C6 junction	9.8
Q1 base	6.8
Q1 emitter	6.8
Q2 base	9.8
Q2 emitter	7.8

(3) After the replacement of a faulty part, perform alignment procedures given in *d* and *e* below and repeat the procedure given in *a* and *b* above.

d. Alignment Procedure. With A15 extended (*c*(1) above), set the receiver-transmitter front panel controls as follows:

(1) BAND switch at 30-52.
(2) Tuning knobs to 30.00 mc.
(3) Function switch at ON.

e. Alignment Procedure.

(1) Connect the AN/USM-26 between A14J3 and chassis ground.
(2) Adjust A15T1 until the AN/USM-26 indicates 1.0000 mc ±25 cps.
(3) Remove the module extender.

85. Isolating Trouble in Module A16 (fig. 25 and 68)

a. Preparation.

(1) Insert the module extender into J11

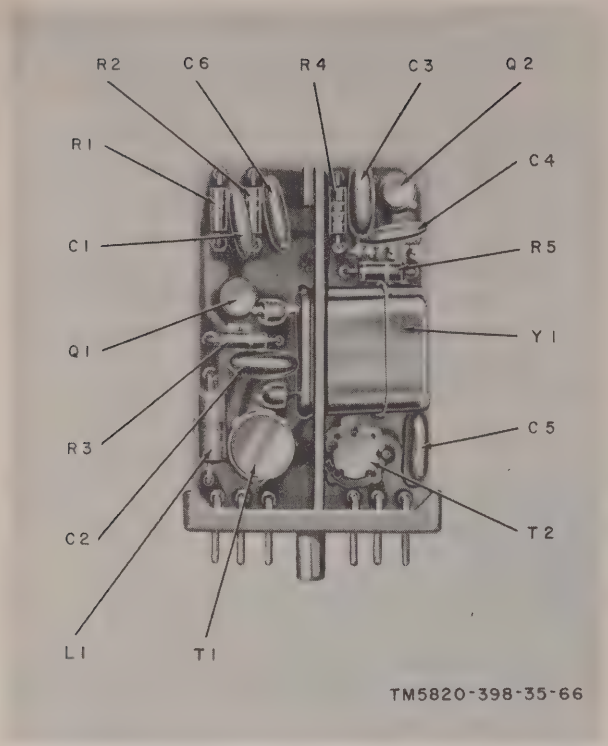


Figure 67. Module A15, parts location.

(receptacle for A16) and insert A16 into the module extender.

(2) Prepare Multimeter ME-26B/U.

(3) Set the front panel controls of the receiver-transmitter as follows:

(a) BAND switch at 30-52.

(b) Tuning knobs to 30.00 mc.

(c) Function switch at ON.

b. Output Voltage Test.

(1) Connect the ME-26B/U between pins C and D of A16J1, and note the voltage.

(2) Connect the ME-26B/U between A16J2 and ground. The ME-26B/U should indicate the same voltage as that in (1) above.

(3) Connect the ME-26B/U between pins F and D of A16J1. With exactly +10 volts input, the ME-26B/U should indicate +9.5 volts dc ±0.5. With a +15 volts dc input ±0, the ME-26B/U should indicate +10 volts dc ±0.5.

(4) Connect the ME-26B/U between A16J3 and ground. The ME-26B/U should provide the same indications as given in (3) above.

c. Faulty Parts Location.

(1) Connect A16 to a 12-volt, dc-power source. Measure the voltages at the points outlined in the chart in (2) below. Compare them with the normal dc voltages listed.

Note: Measure all voltages to ground.

(2) *Dc voltage chart.*

Point of measurement	Volts (dc)
J1 pin C	12.5
Q1 emitter	12.2
Q1 collector	9.8
Q1 base	12.0
J3	9.8
J1 pin F	9.8
Q2 emitter	4.7
Q2 collector	12.0
Q2 base	5.3

(3) Remove the module extender.

86. Isolating Trouble in Module A17 (fig. 23 and 69)

a. Preparation.

(1) Prepare the following equipment:

(a) Multimeter ME-26B/U.

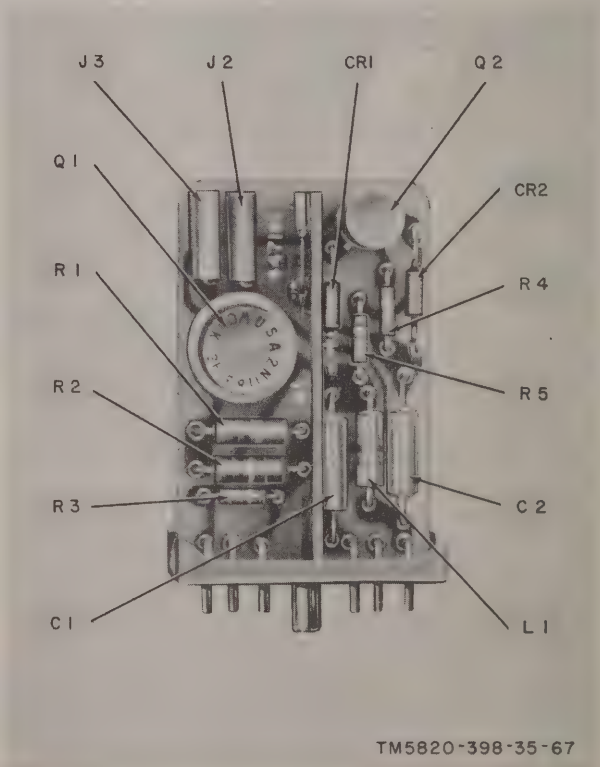


Figure 68. Module A16, parts location.

(b) Rf Millivoltmeter 411A.
(c) Oscilloscope AN/USM-50A.
(d) R. F. Signal Generator AN/URM-25F.
(e) Frequency Meter AN/USM-26.
(f) Module extender.

(2) Insert the module extender into J13 (receptacle for A17). Insert A17 into the module extender.
(3) Set the AN/URM-25F output signal frequency to 5.6 mc.
(4) Connect the AN/URM-25F between A18J2 and chassis ground.
(5) Connect the 411A between pin B of A17J1 and ground.
(6) Connect the ME-26B/U between pin F of A17J1 and ground.
(7) Set the receiver-transmitter function switch to ON, and the tuning knobs to 30.05 mc.
(8) Remove module A12.

b. Bandwidth Test.

(1) Adjust the AN/URM-25F for a 0.2-volt rms indication on the 411A.
(2) Note the voltage at pin F of A17J1, indicated by the ME-26B/U. Normal voltage indication is 3.8 volts dc.
(3) Connect the AN/USM-26 across the AN/URM-25F output and adjust the AN/URM-25F frequency to 5.6000 mc as indicated by the AN/USM-26.
(4) Connect the AN/USM-50A to A17J2.
(5) Connect the 411A across the AN/URM-25F output.
(6) Adjust the AN/URM-25F signal level to 0.1 volt as indicated by the 411A and note the indication obtained on the AN/USM-50A.
(7) The normal peak-to-peak indication displayed on the AN/USM-50A should exceed 4.5 volts.
(8) If the test results are not normal, proceed to *c* below. (Do not disturb the test equipment settings.)

c. Alignment.

(1) Disconnect the 411A from the AN/URM-25F. Use the 411A to measure signal level between A10J3 and chassis ground. A normal indication is 1.8 volts rms.
(2) Adjust T1 for a peak indication on the AN/USM-50A (connected to pin F of A17J1).
(3) Repeat the procedures given in *b* above.

d. Faulty Part Isolation.

(1) Set the AN/URM-25F frequency to 5.6 mc, and the level to 0.1 volt rms at A18J2.
(2) Measure the voltages at the points listed in the charts below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground, with S2 (fig. 31) pressed during the test.

(a) Signal voltage chart.

Point of measurement	Volts (rms)
Q1 base	0.088
Q1 emitter	0
Q1 collector	4.8

(b) Dc voltage chart.

Point of measurement	Volts (rms)
J1-A	10
Q1 base	7.7
Q1 emitter	8.0
Q1 collector	0
CR1-C3 junction	6.6
CR2-C4 junction	1.3

(3) After replacing a faulty part, repeat the procedures given in *b* and *c* above.

87. Isolating Troubles in Module A18 (fig. 22 and 70)

a. Preparation.

(1) Prepare the following equipment:
(a) Rf Millivoltmeter 411A.
(b) Frequency Meter AN/USM-26.
(c) R.F. Signal Generator AN/URM-25F.
(d) Multimeter ME-26B/U.
(e) Module extender.

(2) Remove modules A10, A12, and A18.
(3) Insert the module extender into J14 (receptacle for A18) and insert A18 into the module extender.
(4) Turn the receiver-transmitter function switch to ON.

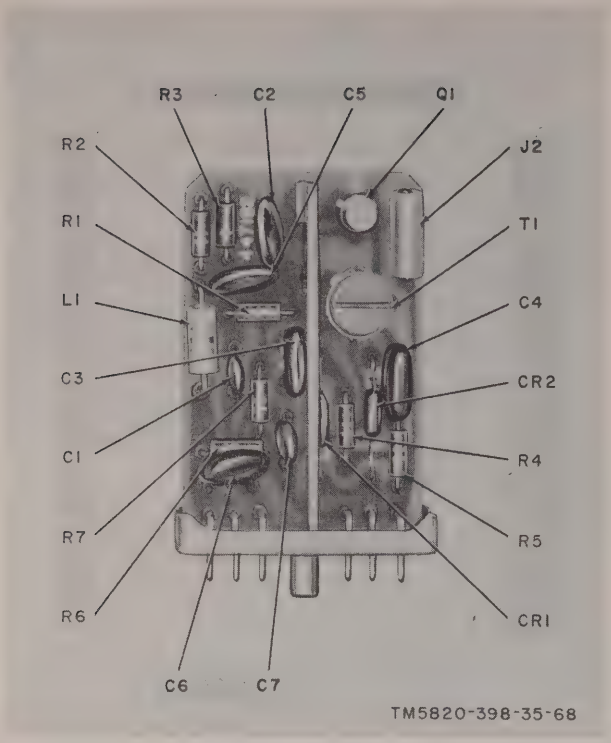


Figure 69. Module A17, parts location.

b. Gain Test.

(1) Connect the AN/URM-25F between pin F of A18J1 and ground. Connect the 411A and the AN/URM-26 across the AN/URM-25F output.

(2) Adjust the AN/URM-25F frequency to 5.6000 mc as indicated by the AN/USM-26 and the level to 4 millivolts, as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-25F and connect it between A18J2 and chassis ground.

(4) A normal output signal voltage at A18J2 is 0.1 volt rms, as indicated by the 411A.

(5) If a proper indication is not obtained, proceed to *d* below. (Do not disturb the test equipment settings.)

(6) If the proper indication is obtained, proceed to *c* below. (Do not disturb the test equipment settings.)

c. Bandwidth Test.

(1) Connect the 411A across the AN/URM-25F output.

(2) Adjust the AN/URM-25F signal level to 1.5 millivolts, as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-25F and connect it between A18J2 and chassis ground.

(4) Adjust the AN/URM-25 frequency to 5.3000 mc as indicated by the AN/USM-26. Normal 411A indication at A18J2 should be 0.07 volt rms.

(5) Adjust the AN/URM-25F frequency to 5.9000 mc as indicated by the AN/USM-26. Normal 411A indication at A18J2 should be 0.07 volt rms.

(6) If the indications obtained in the procedures given in (4) and (5) above are not normal, proceed to *d* below. (Do not disturb test equipment settings.)

(7) If the indications obtained in (4) and (5) above are normal, the A18 testing is completed.

d. Alignment Procedure.

(1) Connect the 411A across the AN/URM-25F output.

(2) Adjust the AN/URM-25F frequency to 5.6000 mc as indicated by the AN/USM-26 and the level to 1.5 millivolts, as indicated by the 411A.

(3) Disconnect the 411A from the AN/URM-25F and connect it between A18J2 and chassis ground.

(4) Adjust L1, T1, L2, and T2 for peak indication on the 411A.

(5) Repeat the procedure given in *b* and *c* above.

e. Faulty Parts Isolation.

(1) Set the AN/URM-25F output frequency to 5.600 mc as indicated by the AN/USM-26 and adjust the voltage level between pin F of A18J1 and chassis ground to 2 millivolts as indicated by the 411A.

(2) Measure the voltages at the points listed in the charts given in (*a*) and (*b*) below. Compare these with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Volts (rms)
Q1 base	0.002
Q1 emitter	0
Q1 collector	0.200
Q2 base	0.0025
Q2 emitter	0.0037
Q2 collector	1.4
J2	0.095

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	5.0
Q1 emitter	5.2
Q1 collector	0
Q2 base	5.0
Q2 emitter	5.2
Q2 collector	0
R1-R9 junction	8.0

(3) After replacing a faulty part, repeat all procedures given above.
(4) Replace modules A10 and A12. Remove the module extender.

88. Isolating Troubles in Module A19 (fig. 9 and 71)

a. Preparation.

(1) Prepare the following equipment:
(a) Audio Oscillator TS-382F/U.
(b) Frequency Meter AN/USM-26.
(c) Meter, Modulation ME-57/U.
(d) Voltmeter, Meter ME-30A/U.
(e) Spectrum Analyzer TS-723A/U.
(f) Multimeter ME-26B/U.
(g) Oscilloscope AN/USM-50A.
(h) Rf Millivoltmeter 411A.
(i) Adapter UG-274B/U.
(j) Rf Wattmeter AN/URM-43A.
(k) Module extender.
(2) Remove A19.
(3) Insert the module extender into J15 (receptacle for A19) and insert A19 into the module extender.
(4) Connect the AN/URM-43A to ANT connector J2.

b. Level and Frequency Test.

(1) Connect the AN/USM-26 between A20J2 and chassis ground.
(2) Turn the receiver-transmitter function switch at ON, and set the BAND switch at 30-52.

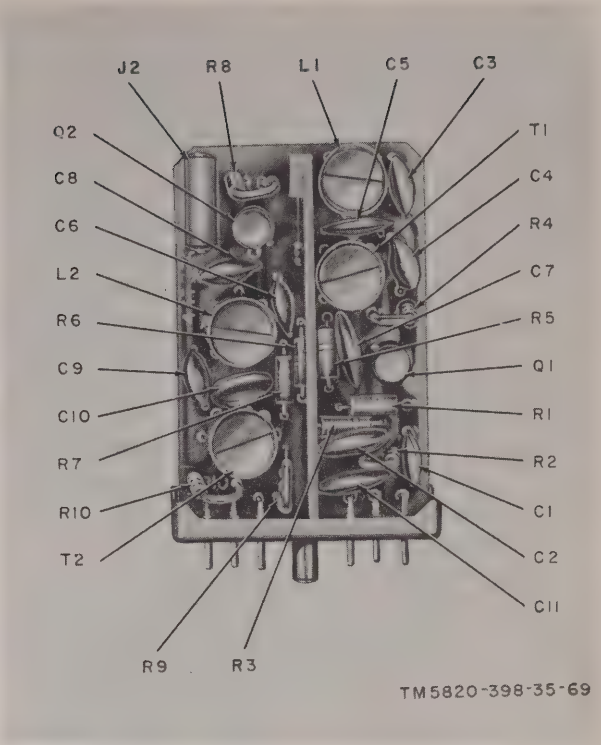


Figure 70. Module A18, parts location.

(3) Connect the 411A to A20J2.
(4) Depress and hold the push-to-talk switch. Observe the 411A and the AN/USM-26.
(5) The output level, indicated by the 411A, should be 650 millivolts.
(6) The output frequency, indicated by the AN/USM-26, should be 11.4485 mc ±300 cps.
(7) Release the push-to-talk switch.
(8) Disconnect the AN/USM-26 from A20J2. Connect the ME-57/U between A20J2 and chassis ground.
(9) Press the push-to-talk switch. Observe the indication on the ME-57/U. Deviation indicated by the ME-57/U should be 3 kc ±0.5 kc. Release the push-to-talk switch.
(10) Change the receiver-transmitter BAND switch from 30-52 to 53-75.
(11) Press the push-to-talk switch and observe the 411A and the ME-57/U.
(12) The 411A should indicate 650 millivolts; the ME-57/U should indicate a deviation of 3 kc ±0.5.
(13) Release the push-to-talk switch.
(14) Disconnect the ME-57/U from

A20J2 and connect the AN/USM-26 to that point.
(15) Press the push-to-talk switch.
(16) The AN/USM-26 should indicate 11.5485 mc ±300 cps.
(17) Release the push-to-talk switch.
(18) If the indications obtained in the procedure given in (5), (6), (9), (120), and (16) above are not normal, proceed to the alignment procedures in c below. (Do not disturb equipment settings or connections.)
(19) If the indications obtained above are normal, the A19 testing is completed.

c. Alignment Procedure.
(1) Remove module A23.
(2) Connect the TS-382F/U between pin D of an AUDIO connector and ground. Connect the ME-30A/U across the TS-382F/U output.
(3) Adjust the TS-382F/U frequency to 1 kc and the level to 1.4 millivolts, as indicated by the ME-30A/U.
(4) Connect the ME-57/U across the AN/USM-26 input through a UG-274B/U.
(5) Connect the TS-723A/U to the AUDIO OUTPUT connector of the ME-57/U.
(6) Connect the AN/USM-50A between A22J3 and chassis ground.
(7) Turn the receiver-transmitter BAND switch to 30-52. Press and hold the push-to-talk switch.
(8) Adjust the output level of the TS-382F/U to obtain a 5-volt peak-to-peak presentation on the AN/USM-50A. If clipping is observed, slowly decrease the TS-382F/U output level until the wave becomes sinusoidal.
(9) Adjust C4 for a minimum indication on the ME-57/U.
(10) Adjust C5 until the AN/USM-26 indicates 11.4485 mc ±300 cps.
(11) Adjust L2 until the ME-57/U indicates a 10 kc ±2 deviation.
(12) Readjust C4 to obtain a maximum distortion indication on the TS-723A/U.
(13) Repeat the procedures given in (10) through (12) above as required. Release the push-to-talk switch.
(14) Change the receiver-transmitter BAND switch from 30-52 to 53-75.
(15) Press and hold the push-to-talk switch. Repeat the procedures given in (8) above if required.
(16) Adjust C1 for a minimum indication on the ME-57/U.
(17) Adjust C2 until the AN/USM-26 indicates 11.5485 mc ±300 cps.
(18) Adjust L1 until the ME-57/U indicates a 10 kc ±2 deviation.
(19) Readjust C1 to obtain a minimum distortion indication on the TS-723A/U.
(20) Repeat the procedures given in (17) through (20) above as required. Release the push-to-talk switch.

d. Faulty Part Isolation.
(1) Remove module A19.
(2) Make resistance checks, using the ME-26B/U, between the pins of J1 on A19 listed in the chart below:

Point of measurement	Ohms
F and C	18K
F and E	18K
D and C	18K
D and E	18K

(3) Check crystals A19Y1 and A19Y2 by substitution.
(4) After replacing a faulty part, replace module A19 and repeat the procedures given in *b* and *c* above. Replace module A23.

89. Isolating Troubles in Module A20 (fig. 8 and 72)

a. Preparation.
(1) Prepare the following equipment:
(a) Audio Oscillator TS-382F/U.
(b) Frequency Meter AN/USM-26.
(c) Meter, Modulation ME-57/U.
(d) Rf Millivoltmeter 411A.
(e) Voltmeter, Meter ME-30A/U.
(f) Oscilloscope AN/USM-50A.
(g) Rf Wattmeter AN/URM-43A.
(h) Module extender.
(2) Remove modules A20 and A23.

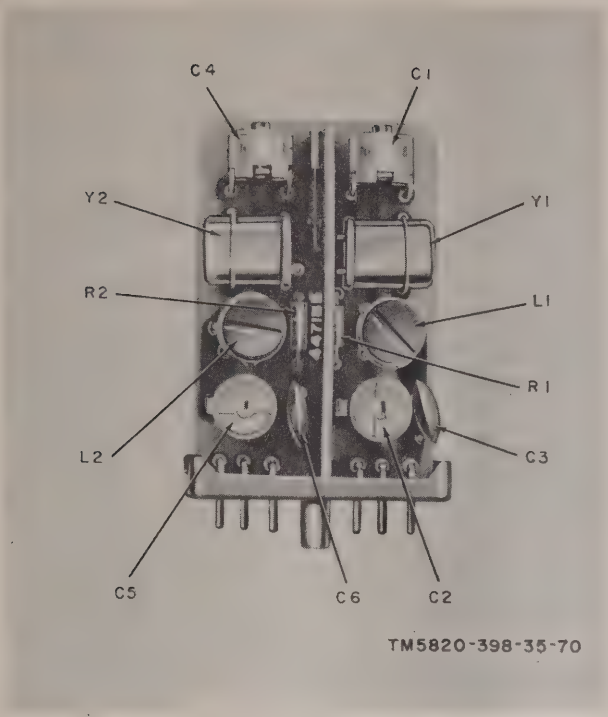


Figure 71. Module A19, parts location.

Place the alignment cover (fig. 28) on A20.

(3) Insert the module extender into J16 (receptacle for A20). Insert A20 into the module extender.

(4) Connect the AN/URM-43A to ANT connector J2.

b. Frequency Accuracy Test.

(1) Set the receiver-transmitter BAND switch at 30-52, and the function switch at ON.

(2) Connect the 411A and the AN/USM-26 to A20J2.

(3) Press the push-to-talk switch.

(4) The AN/USM-26 should indicate 11.451 mc ±500 cps, and the 411A should indicate 0.68 volt rms.

(5) Turn the BAND switch to 53-75. The AN/USM-26 should indicate 11.551 mc ±500 cps, and the 411A should indicate 0.68 volt rms.

(6) If the frequencies given in (4) and (5) above cannot be obtained, proceed to *d* below.

c. Frequency Deviation Test.

(1) Connect the TS-382F/U between pin D of an AUDIO connector and ground. Connect the ME-30A/U across the TS-382F/U output.

(2) Adjust the TS-382F/U frequency to 1 kc and the level to 1.4 millivolts, as indicated by the ME-30A/U.

(3) Connect the ME-57/U to A20J2.

(4) Press the push-to-talk switch and repeat the procedure given in (2) above.

(5) The ME-57/U should indicate a deviation of 10 kc ±2.

(6) Release the push-to-talk switch.

(7) If the deviation given in (5) above is not obtained, proceed to *e* below.

d. Alignment Procedures.

(1) Turn the receiver-transmitter BAND switch to 30-52.

(2) Press the push-to-talk switch.

(3) Connect the AN/USM-26 and the 411A between A20J2 and chassis ground; adjust T1 for 11.451 mc ±500 cps.

(4) Adjust T2 for a peak indication on the 411A.

(5) Release the push-to-talk switch.

(6) If the indications given in (3) and (4) are not obtained, proceed to *e* below. If they are obtained, repeat *c* above.

e. Faulty Part Isolation.

(1) Press the push-to-talk switch.

(2) Set the TS-382F/U frequency to 1 kc and the level to 1.4 millivolts. Connect TS-382F/U between pin D of an AUDIO connector and ground.

(3) Measure the voltages at the points listed in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Volts (rms)
Q1 base	1.8
Q1 emitter	1.85
Q1 collector	0
CR1-C4 junction	2.8
Q2 base	0.2
Q2 emitter	0
Q2 collector	1.8
J2	0.68

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	5.9
Q1 emitter	5.7
Q1 collector	0
CR1-C4 junction	4.8
Q2 base	4.7
R8-R7 junction[a]	4.0 peak-to-peak

[a]Make this measurement with the AN/USM-50A.

(4) After replacing a faulty part, repeat the procedures given in *b*, *c*, and *d* above.
(5) Replace module A23. Remove the module extender.

90. Isolating Trouble in Module A21 (fig. 85 and 73)

a. Preparation.
(1) Prepare the following equipment:
(a) Signal Generator AN/URM-48.
(b) Frequency Meter AN/USM-26.
(c) Voltmeter, Meter ME-30A/U.
(d) Rf Millivoltmeter 411A.
(e) Spectrum Analyzer TS-723A/U.

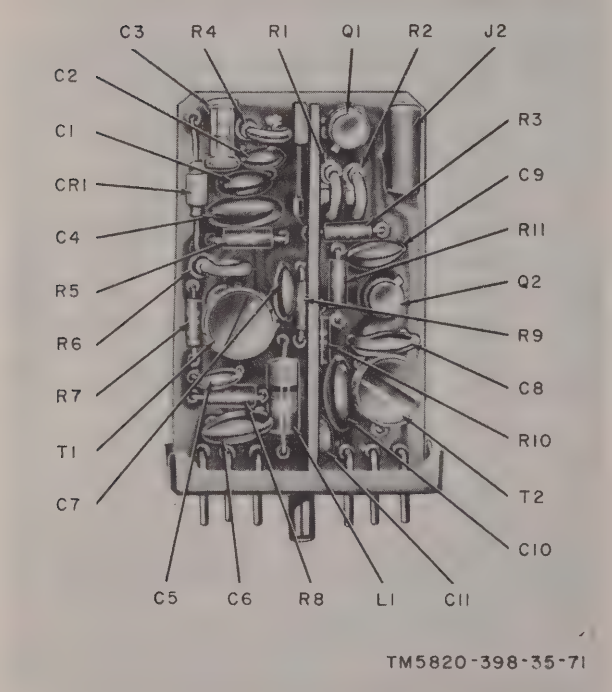


Figure 72. Module A20, parts location.

(f) Handset H-138/U.
(g) Rf Wattmeter AN/URM-43A.
(h) Multimeter ME-26B/U.
(2) Remove module A5.
(3) Connect the H-138/U to an AUDIO connector.
(4) Set the receiver-transmitter function switch at ON.
(5) Connect the AN/URM-43A to ANT connector J2.
(6) Connect the AN/URM-48 output to the AN/USM-26. Adjust the AN/URM-48 frequency to 11.500 mc, as indicated by the AN/USM-26.
(7) Disconnect the AN/URM-48 from the AN/USM-26 and connect it between pins C and D of J9 (receptacle for A5).
(8) Frequency modulate the AN/URM-48 with a 1,000-cps sinusoidal signal at a deviation of ±10 kc peak.

b. Gain Test.
(1) Connect the 411A across the output of the AN/URM-48.
(2) Adjust the level of the AN/URM-48 to obtain a 1-millivolt indication on the 411A.
(3) Connect the ME-26/U between A25J4 and ground.
(4) Adjust the receiver-transmitter VOLUME control to obtain a 1.0-volt indication on the ME-26/U.
(5) Connect the ME-30A/U between A25J3 and ground. The ME-30A/U should indicate between 180 and 360 millivolts. Record the voltage.
(6) Decrease the AN/URM-48 level until the ME-30A/U indication decreases 3 db from the level noted in (5) above.
(7) The AN/URM-48 output level across pins C and D of J9 should be between 2.5 and 5.0 microvolts rms.
(8) If the results given in (1) through (7) above are not obtained, proceed to e below.

c. Bandwidth Test.
(1) Repeat the procedures given in *a*(1) through (8) above.
(2) Connect the 411A between the case of Q4 and ground.

(3) Adjust the output of the AN/URM-48 until the voltage indicated on the 411A is 100 millivolts. Record the AN/URM-48 setting, which should be about 20 microvolts.
(4) Increase the AN/URM-48 output 6 db above that noted in (3) above.
(5) Increase the AN/URM-48 frequency until the voltage indicated by the 411A is 100 millivolts.
(6) Connect the AN/URM-48 to the AN/USM-26. Record the frequency indicated by the AN/USM-26.
(7) Adjust the AN/URM-48 frequency to 11.500 mc and the level to that noted in (4) above between pins C and D of J9.
(8) Decrease the AN/URM-48 frequency until the voltage indicated by the 411A is 100 millivolts.
(9) Connect the AN/URM-48 to the AN/USM-26. Record the frequency indicated by the AN/USM-26.
(10) The difference between the frequencies noted in (6) and (9) above is the 6-db bandwidth and should not be less than 32 kc.
(11) If the 6-db bandwidth is not as described above, proceed to *e* below.
(12) Adjust the frequency of the AN/URM-48 to 11.500 mc and the output voltage to 60 db above the level noted in (3) above across pins C and D of J9.
(13) Increase the AN/URM-48 frequency until the voltage indicated by the 411A is 100 millivolts.
(14) Connect the AN/URM-48 to the AN/USM-26. Record the frequency indicated by the AN/USM-26.
(15) Adjust the AN/URM-48 frequency to 11.500 mc and the output voltage to 60 db above the level noted in (3) above across pins C and D of J9.
(16) Decrease the AN/URM-48 frequency until the voltage indicated by the 411A is 100 millivolts.
(17) Connect the AN/URM-48 to the AN/USM-26. Record the frequency indicated by the AN/USM-26.
(18) The difference between the frequencies noted in (14) and (17) above is the 60-db bandwidth and should not exceed 100 kc.
(19) If the 60-db bandwidth is not as described, proceed to *e* below.

d. Alignment Procedure.

(1) Repeat the procedures given in *a*(1) through (9) above.
(2) Set the VOLUME control on the receiver-transmitter fully counterclockwise.
(3) Adjust the AN/URM-48 output voltage to 2.5 microvolts between pins C and D of J9.
(4) Tune T1 and T2 for a maximum indication on the ME-30A/U.
(5) Adjust the VOLUME control on the receiver-transmitter to produce not more than 1 volt of audio signal as indicated by the ME-26B/U (connected between A25J4 and ground).
(6) Connect the TS-723A/U between A25J4 and chassis ground.
(7) Tune L4 and T2 for a minimum 1,000-cycle distortion as indicated by the TS-723A/U.
(8) Repeat the procedures given in (4) through (7) above until the audio output, indicated by the ME-20A/U, cannot be increased by tuning.
(9) Replace A5.

e. Faulty Parts Isolation.

(1) Remove A5.
(2) With the AN/URM-48 set to 11.50 mc, adjust the output level at J9, pins C and D, as indicated in the chart in (*a*) below.
(3) Measure the voltages at the points listed in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltage listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
Q1 collector[a]	185
Q1 base[a]	22
Q2 collector[a]	630
Q2 base[a]	185
Q2 emitter[a]	17
Q3 collector[b]	120
Q3 base[b]	4.8
Q4 collector[b]	400
Q4 base[b]	54

Point of measurement	Millivolts (rms)
Q5 collector[c]	160
Q5 base[c]	49
Q6 collector[c]	1.65 volts
Q6 base[c]	150

[a]Make this measurement with the AN/URM-48 output adjusted to 30 millivolts.

[b]Make this measurement with the AN/URM-48 output adjusted to 100 microvolts.

[c]Make this measurement with the AN/URM-48 output adjusted to 5 microvolts.

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 collector	1.2
Q1 base	3.0
Q1 emitter	3.7
Q2 collector	0.8
Q2 base	4.6
Q2 emitter	4.9
Q3 collector	0
Q3 base	3.8
Q3 emitter	4.2
Q4 collector	0.8
Q4 base	2.9
Q4 emitter	3.3
Q5 collector	1.0
Q5 base	2.7
Q5 emitter	3.0
Q6 collector	0
Q6 base	3.7
Q6 emitter	3.85

(4) After replacing a faulty part, repeat the procedures given in *d* above.

91. Isolating Troubles in Module A22 (fig. 6 and 74)

a. Preparation.

(1) Prepare the following test equipment:
- *(a)* Audio Oscillator TS-382F/U.
- *(b)* Multimeter ME-26B/U.
- *(c)* Spectrum Analyzer TS-723A/U.
- *(d)* Handset H-138/U.
- *(e)* Rf Wattmeter AN/URM-43A.
- *(f)* Voltmeter, Meter ME-30A/U.

(2) Connect the AN/URM-43A to ANT connector J2.

(3) Remove module A23.

(4) Connect the H-138/U to an AUDIO connector.

(5) Set the front panel controls of the receiver-transmitter as follows:
- *(a)* BAND switch at 30-52.

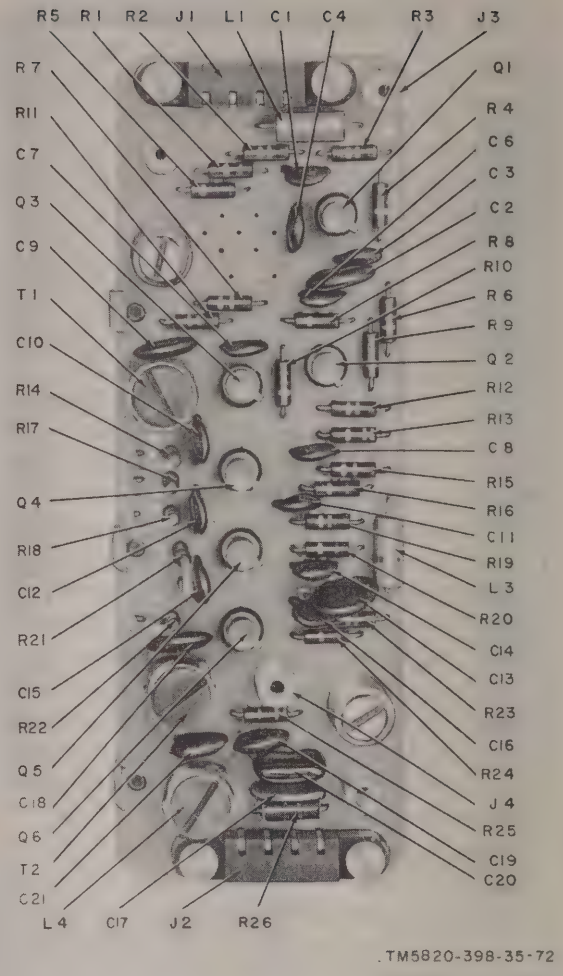


Figure 73. Module A21, parts location.

- *(b)* Tuning knobs for 30.00 mc.
- *(c)* Function switch at ON.

b. Speech Amplifier Limiter Distortion Test.

(1) Connect TS-382F/U between pins 3 and 4 of A22J1. Connect the ME-30A/U across the TS-382F/U output.

(2) Set TS-382F/U for an output frequency of 500 cps. Adjust the TS-382F/U for a 1-millivolt indication on the ME-30A/U. (Maintain this level for each frequency setting.)

(3) Connect the TS-723A/U between A22J3 and ground. Press the push-to-talk switch. Measure the audio distortion. Repeat the procedure

given above for 300 cps, 2 kc, and 3 kc. Normal test results for each setting is 3.5 percent. Normal output signal level for each setting is 1.4 volts rms.

(4) If the audio distortion output level is found to be greater than the prescribed levels, proceed to *c* below.

c. Faulty Part Isolation.

(1) Set the TS-382F/U to 1 kc, and adjust its output for a 1-millivolt rms indication on the ME-30A/U.

(2) With the push-to-talk switch pressed, measure the voltages at the points listed in the charts in *a* and *b* below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
Q1 base	0.86
Q1 emitter	0.65
Q1 collector	15
Q2 base	15
Q2 emitter	11
Q2 collector	158
Q3 base	155
Q3 emitter	138
Q3 collector	1.4 volts
J3	1.4 volts

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	6.0
Q1 emitter	6.3
Q1 collector	3.5
Q2 base	5.9
Q2 emitter	6.0
Q2 collector	2.7
Q3 base	5.9
Q3 emitter	6.0
Q3 collector	2.8

(3) After replacing a faulty part, repeat the procedure given in *b* above.

(4) Replace A23.

92. Isolating Trouble in Module A23 (fig. 7 and 76)

a. Preparation.

(1) Prepare the following equipment:

(a) Frequency Meter AN/USM-26.

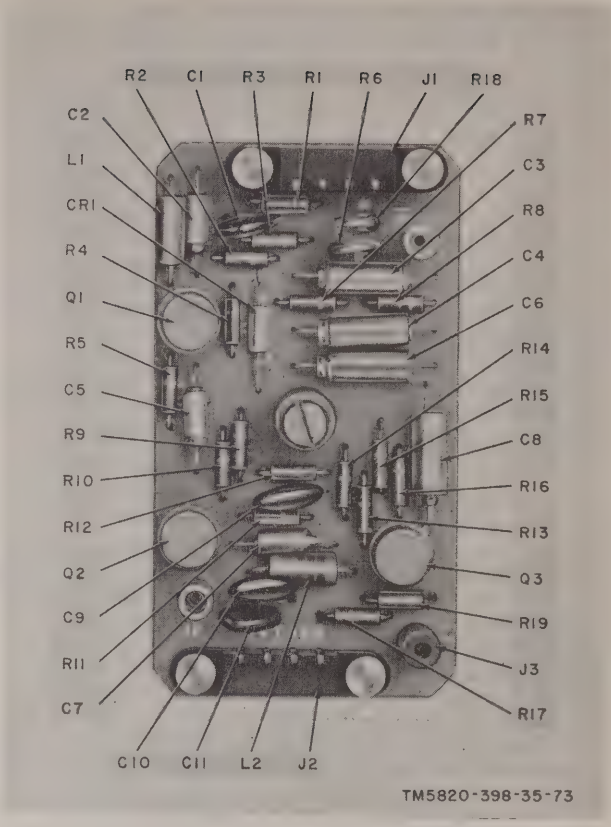


Figure 74. Module A22, parts location.

(b) Multimeter ME-26B/U.

(c) Handset H-138/U.

(d) Rf Wattmeter AN/URM-43A.

(2) Connect AN/URM-43A to ANT connector J2.

(3) Set the front panel controls of the receiver-transmitter as follows:

(a) BAND switch at 30-52.

(b) Tuning knobs for 30.00 mc.

(c) Function switch at ON.

(4) Connect the H-138/U to an AUDIO connector.

(5) Press the push-to-talk switch.

b. 150-Cps Tone Test.

(1) Connect the ME-26B/U between A23J3 and ground.

(2) Adjust R12 for an ME-26B/U indication of 0.8 volt.

(3) Adjust the AN/USM-26 to indicate 150 cps and connect it between A23J3 and ground.

(4) Adjust R3 to obtain a 150-cps indication on the AN/USM-26.

(5) If the prescribed levels are not obtained, proceed to *c* below.

c. Faulty Part Isolation.

(1) Measure the voltages at the points listed in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.
Note: Make all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
Q1 base	39
Q1 emitter	35
Q1 collector	2.0 volts
Q2 emitter	17
J3	800

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	8.9
Q1 emitter	9.2
Q1 collector	6.0
Q2 base	9.2
Q2 emitter	9.4
Q2 collector	6.0
J3	2.7

(2) After replacing a faulty part, repeat *b* above.

93. Isolating Troubles in Module A24 (fig. 5 and 76)

a. Preparation.

(1) Prepare the following equipment:
(a) Audio Oscillator TS-382F/U.
(b) Voltmeter, Meter ME-30A/U.
(c) Multimeter ME-26B/U.
(2) Connect the TS-382F/U between A25J3 and ground.
(3) Connect the ME-30A/U across the TS-382F/U output.
(4) Set the TS-382F/U frequency to 150 cps and the level to 20 millivolts, as indicated by the ME-30A/U.
(5) Set the ME-26B/U to indicate ohms (R x 1K).
(6) Remove module A21.
(7) Set the front panel controls of the receiver-transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs for 30.00 mc.
(c) Function switch at RETRANS.

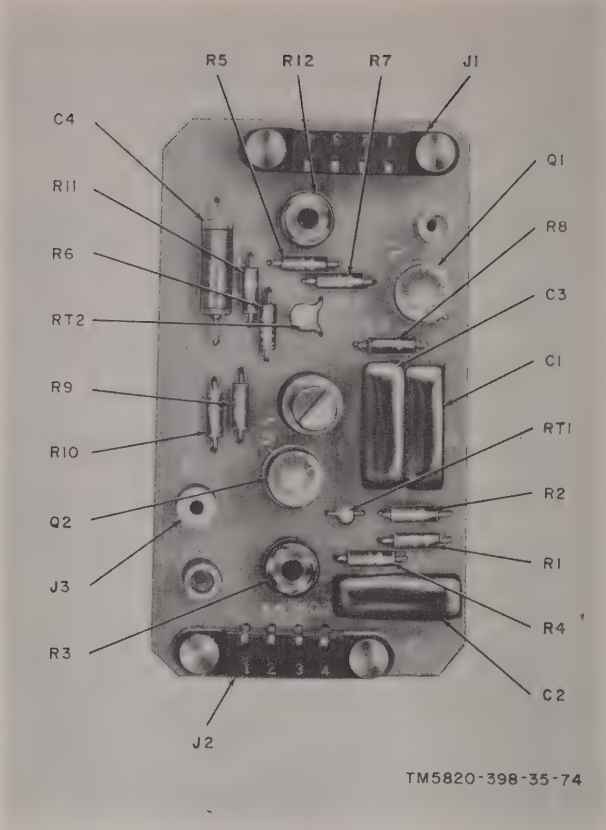


Figure 75. Module A23, parts location.

b. Performance Test.

(1) Disconnect the ME-30A/U from the TS-382F/U and connect it between pins 1 and 2 of A24J1.
(2) Adjust the TS-382F/U for a 10-millivolt indication on the ME-30A/U.
(3) Connect the ME-26B/U between contact 7 of squelch relay K3 and ground. The ME-26B/U indication should be infinity.
(4) Slowly increase the TS-382F/U level until the ME-26B/U indicates 0 ohms.
(5) The ME-30A/U indication should be 20 millivolts ±5.
(6) If the indication obtained in (5) above exceeds the limits, adjust the TS-382F/U level to obtain a 20-millivolt indication on the ME-30A/U. Adjust R15 until the ME-26B/U indicates 0 ohms.
(7) Increase the TS-382F/U level to obtain a 50-millivolt indication on the ME-30A/U.

(8) Increase the TS-382F/U frequency to 160 cps. The ME-26B/U indication should remain zero.
(9) Increase the TS-382F/U frequency to 170 cps. The ME-26B/U inication should be infinity.
(10) Decrease the TS-382F/U frequency to 140 cps. The ME-26B/U indication should be zero.
(11) Decrease the TS-382F/U frequency to 130 cps. The ME-26B/U indication should be infinity.

c. Faulty Parts Isolation.

(1) Set the TS-382F/U frequency to 150 cps and the level to 20 millivolts at A24J1 pins 1 and 2.
(2) Measure the voltages at the points listed in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.

Note: Measure all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
Q1 base	1.8
Q1 emitter	2.1
Q1 collector	48
Q2 base	2.2
Q2 emitter	2.1
Q2 collector	0
Q3 base	48
Q3 collector	600
Q4 base	540
Q4 emitter	0
Q4 collector	90
J2-3	90

(b) Dc voltage chart.

Point of measurement	Volts (dc)
J2-1	10
Q1 base	9.1
Q1 emitter	9.3
Q1 collector	8.3
Q2 base	9.1
Q2 emitter	9.3
Q2 collector	0
Q3 base	8.3
Q3 emitter	8.5
Q3 collector	4.4
Q4 base	-0.12
Q4 emitter	0
Q4 collector	4.4
Q5 base	4.4
Q5 emitter	4.6
Q5 collector	0

(3) After replacing a faulty part, repeat the procedure given in *b* above.
(4) Replace A21.

94. Isolating Trouble in Module A25 (fig. 4 and 77)

a. Preparation.

(1) Prepare the following equipment:
(a) Audio Oscillator TS-382F/U.
(b) Voltmeter, Meter ME-30A/U.
(c) Spectrum Analyzer TS-723A/U.
(d) Handset H-138/U.
(e) Rf Wattmeter AN/URM-43A.
(f) Multimeter ME-26B/U.
(2) Remove module A21.
(3) Connect the AN/URM-43A to ANT connector J2.
(4) Connect the H-138/U to an AUDIO connector.
(5) Set the front panel controls of the receiver-transmitter as follows:
(a) BAND switch at 30-52.
(b) Tuning knobs for 30.00 mc.
(c) Function switch at ON.
(6) Connect the TS-382F/U between A25J3 and ground. Connect the ME-30A/U across the TS-382F/U output.
(7) Adjust the TS-382F/U frequency to 1 kc and the level to 0.25 volt as indicated by the ME-30A/U.

b. Audio Amplifier Distortion and Output Test.

(1) Connect the ME-30A/U to A25J4 and adjust the front panel VOLUME control to obtain an ME-30A/U indication of 1 volt. Maintain this level for each setting.

Note: If the 1-volt audio output level cannot be obtained, proceed to *c* below.

(2) Connect the TS-723A/U to A25J4, and measure the audio distortion. Repeat the procedure above for 300 cps, 2 kc, and 3 kc. The normal result should be less than 3 percent for each setting.

c. Faulty Part Isolation.

(1) Set the TS-382F/U to 1 kc, and adjust its output for a 0.25-volt-rms indication on the ME-30A/U at A25J3.
(2) Adjust the VOLUME control for a 1-volt rms signal at A25J4.

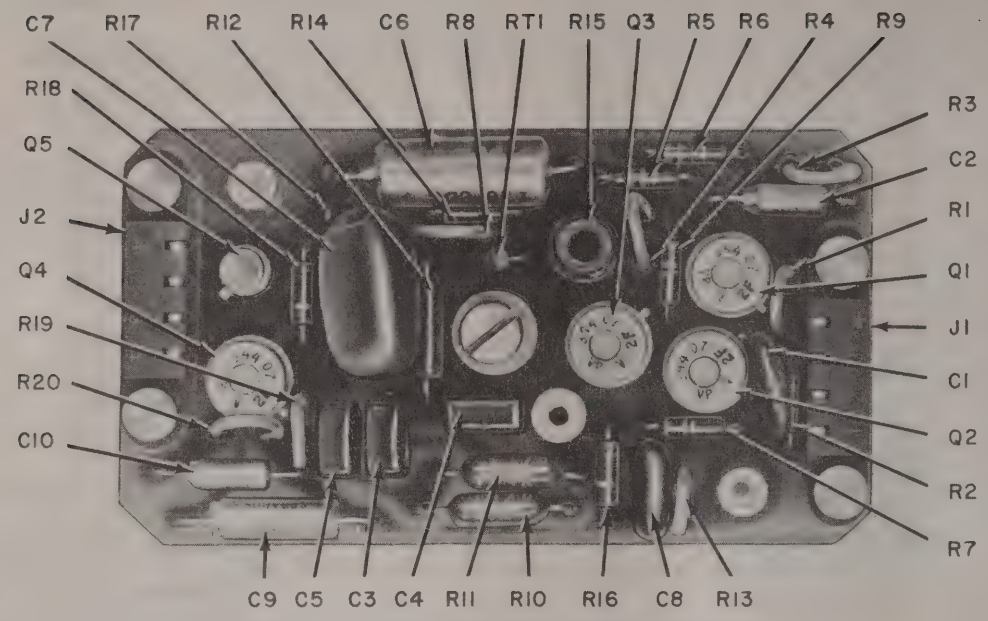


Figure 76. Module A24, parts location.

(3) Measure the voltages at the points listed in the charts in (*a*) and (*b*) below. Compare them with the normal signal and dc voltages listed.

Note: Make all voltages to ground.

(a) Signal voltage chart.

Point of measurement	Millivolts (rms)
J3	250
Q1 base	230
Q1 emitter	230
Q1 collector	0
Q2 base	12
Q2 emitter	7.8
Q2 collector	3.35 volts
J4	1 volt

(b) Dc voltage chart.

Point of measurement	Volts (dc)
Q1 base	4.1
Q1 emitter	0
Q1 collector	4.25
Q2 base	8.5
Q2 emitter	8.7
Q2 collector	0.67

(4) After replacing a faulty part, repeat the procedures given in *a* and *b* above.

(5) Replace A21.

95. Selector Mechanism Disassembly Procedure (fig. 78)

Disassemble the gear train only to the degree required to remove the defective part.

a. Remove the selector mechanism from the receiver-transmitter (para 48).

b. Remove taper pin (48) from arm assembly (49) and remove arm assembly (49). Remove taper pin (13) from stop (14) and remove stop (14).

Note: Setscrews (47) and (15) are not supplied with the selector mechanism, but are used to secure arm assembly (49) and stop (14) to their respective shafts while drilling replacement parts (para 96).

c. Disconnect spring (32) from spring retainer (18) and move arm assembly (33) away from shaft assembly (30) to facilitate removal of shaft assembly (30).

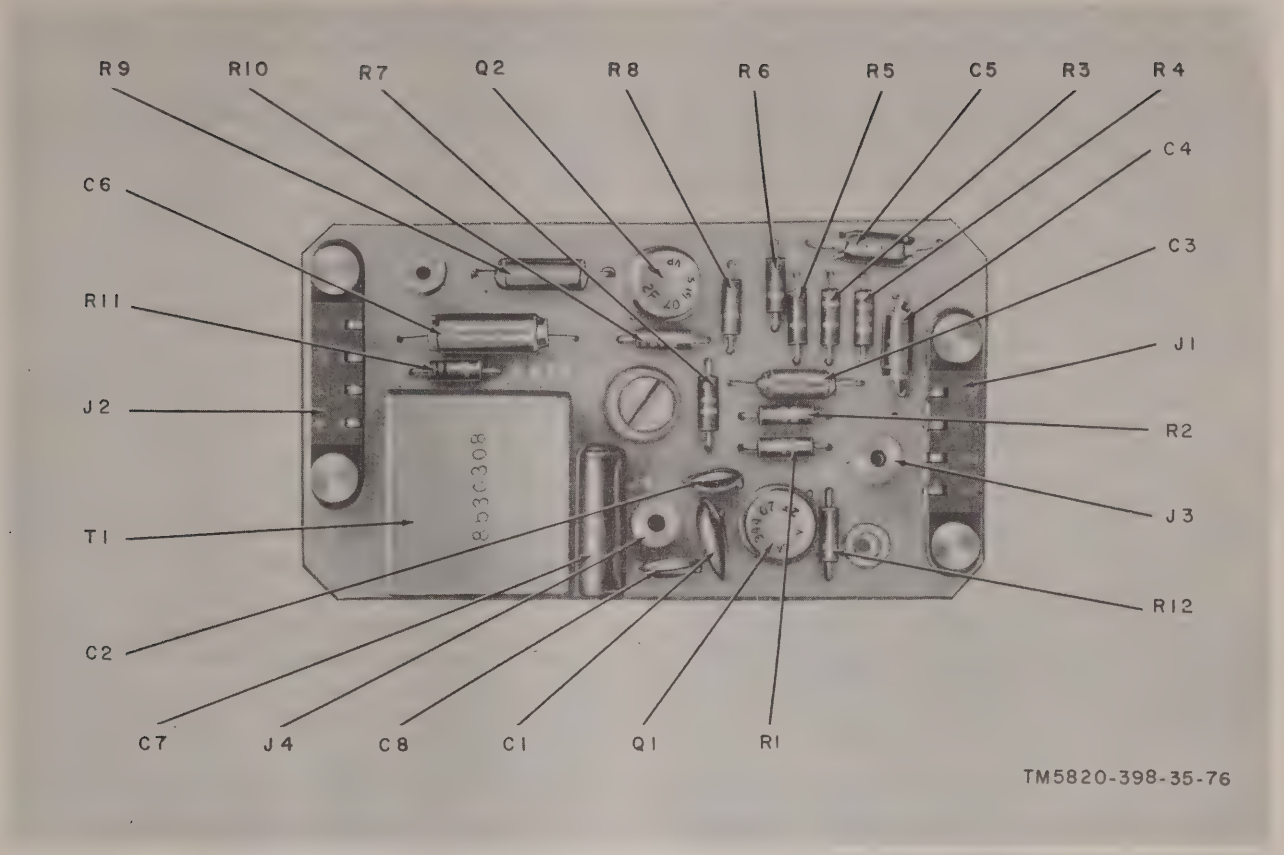


Figure 77. Module A25, parts location.

d. Remove retaining ring (12) from shaft assembly (30) and remove shaft assembly (30), with thrust washer (31) and O-rings (29), from housing assembly (59).

e. Remove pin (5) that secures arm (4) to housing assembly (59) and remove arm (4) and spring (6). Remove bushing (3) from sleeve (2).

f. Remove taper pin (7) that secures sleeve (2) to shaft assembly (16) and remove sleeve (2).

Note: The setscrew (8) is not supplied with the selector mechanism, but is used to secure sleeve (2) to shaft assembly (16) during drilling of replacement parts (para 96).

g. Remove retaining ring (1) that secures shaft assembly (16) to housing assembly (59). Remove shaft assembly (16) and thrust washer (17) from housing assembly (59).

h. Remove retaining ring (34) that secures arm assembly (33) to retaining arm (35). Remove arm assembly (33) and spring (32).

i. Remove ball plunger (38) from housing assembly (59).

Note: To facilitate disassembly, remove shaft assemblies (57) and (69) in one operation (*j* below).

j. Remove retaining rings (45) and (46) that secure shaft assemblies (57) and (69) to housing assembly (59).

k. Remove shaft assemblies (57) and (69) with all attached parts from housing assembly (59).

Note: Treat shaft assembly (57), together with gear segment (81) and gear (82), as one unit. Do not disassemble further.

l. Remove sleeve (85) from spring retainer (18) and disconnect spring (83) from spring retainer (18).

m. Remove screw (50) and lockwasher (51) that secure mask assemblies (53) and (54) to shaft assembly (57).

n. Remove O-rings (52), mask assemblies (53) and (54), thrust washer (58), O-rings (55), and spring (56) from shaft assembly (57).

o. Remove spring (83) and sleeve (84) from mask assembly (53).

p. Remove retaining ring (79) that secures arm assembly (78) to shaft assembly (57). Remove arm assembly (78).

q. Remove spring (56) from arm assembly (78).

r. Remove thrust washer (70) from shaft assembly (69). Remove taper pin (68) from gear (67); then remove O-rings (65) and gear (67) from shaft assembly (69).

Note: Setscrew (66) is not supplied with the selector mechanism, but it is used to secure gear (67) to shaft assembly (69) during drilling of replacement parts (para 96).

s. Remove taper pin (42) and setscrew (43) that secure coupler assembly (44) and remove coupler assembly (44).

t. Remove retaining ring (41) that secures antibacklash gear assembly (36) to housing assembly (59) and remove antibacklash gear assembly (36) and thrust washer (37).

Note: Do not disassemble the antibacklash gear assembly (36) further.

u. Remove retaining ring (71) that secures gear arm (72) and spur gear (73) to stud (74). Remove gear arm (72), spur gear (73), and thrust washer (77).

v. Remove taper pin (62) and setscrew (64) that secure coupler assembly (63) to shaft assembly (75) and remove coupler assembly (63).

w. Remove retaining ring (61) from shaft assembly (75). Remove shaft assembly (75) and thrust washer (76) from housing assembly (59).

x. Remove screw (9), lockwasher (10), and plate (11) that secure thrust washer (19), gear (20), worm (21), and thrust washer (22) to housing assembly (59).

Note: Do not disassemble screw (39), yoke (40), and worm (21).

y. Remove screw (28), lockwasher (27), flatwasher (26), and remove housing (25) from housing assembly (59). Remove lamp (24) from housing (25). If bushing (23) is damaged, press it from housing assembly (59).

96. Selector Mechanism Reassembly Procedure (fig. 78)

In reassembling the gear train, start at that point in the procedure in which the defective part is replaced.

Caution: **Before inserting a taper pin through a gear and a shaft, be sure that the taper pin holes are aligned correctly. Failure to observe this procedure will cause serious damage to the parts.**

Note: Make all pinning operations with the dials set at 30.00 mc. Setscrews (8), (15), (47), and (66) are not supplied with the selector mechanism, but are used to secure replacement parts to gear shafts while drilling. After the pinning operations are completed, remove the setscrews. Setscrews (43) and (64) are supplied with the selector mechanism and are to be replaced in coupler assemblies (44) and (63).

a. When replacing the bushing (23), apply locktite (American Sealants, Grade C, or equal) to the outside shank of the bushing (23) and press it into the housing assembly (59).

b. If replacement is required, replace yoke (40), worm (21), screw (39), and gear (20) at one time. Install thrust washer (22) into housing assembly (59). Insert gear (20) and worm (21) into housing assembly (59) with yoke (40) positioned through housing assembly (59). Place thrust washer (19) over gear (20), and secure in place with plate (11), lockwasher (10), and screw (9).

Note: After gear (20) and worm (21) are secured in housing assembly (59), yoke (40) extension should be 0.462 inch ±0.015. Measure this distance from the centerline of the outer drill hole in the yoke (40) to the casting of the housing assembly (59).

c. Place thrust washer (70) on shaft assembly (69), insert shaft assembly (69) through housing assembly (59) and secure in place with retaining ring (46). Install arm assembly (49) on shaft assembly (69) and secure taper pin (48).

d. Apply locktite (American Sealants, Grade C, or equivalent) to threads of ball plunger (38). Install ball plunger (38) into housing assembly (59); bottom the ball plunger (38) against cam (80) on shaft assembly (69) and then back off ball plunger one-eighth to one-quarter turn.

Note: Before meshing the antibacklash gear assembly (36) with another gear, advance the antibacklash floating gear two teeth, then mesh.

e. Place thrust washer (76) on shaft assembly (75). Insert shaft assembly (75) through housing assembly (59) and secure with retaining ring (61). Position coupler

assembly (63) on shaft assembly (75). Align the holes; insert and secure taper pin (62) and setscrew (64).

f. Place thrust washer (77) and spur gear (73) on stud (74) with the gear hub facing away from housing assembly (59). Mount gear arm (72) on stud (74) while obtaining gear mesh between gear arm (72) and shaft assembly (75). Install retaining ring (71) on stud (74) and secure. Check all parts for freedom of operation.

g. Install thrust washer (37) on shaft of antibacklash gear assembly (36), and insert antibacklash gear assembly (36) into housing assembly (59). Install and secure retaining ring (41) on shaft of antibacklash gear assembly (36). Place coupler assembly (44) on shaft of antibacklash gear assembly (36), align the holes, and secure taper pin (42) and setscrew (43).

h. Connect spring (56) to arm assembly (78).

i. Install arm assembly (78) to shaft assembly (57) and secure with retaining ring (79). Install O-rings (55) on shaft assembly (57).

j. Place sleeve (84) and spring (83) on mask assembly (53). Place sleeve (85) on spring retainer (18).

k. Place mask assemblies (53 and 54) on shaft assembly (57); secure in place with screw (50) and lockwasher (51).

l. Install O-rings (52) on mask assembly (53) and position spring (56) in place on shaft assembly (57). Slide thrust washer (58) on retainer ring side of shaft assembly (57), then position shaft assembly (57) into housing assembly (59) and secure in place with retaining ring (45).

m. Install gear (67) on shaft assembly (69) with hub of gear (67) facing inboard. Insert taper pin (68) and secure gear (67) on shaft assembly (69). Install two O-rings (65) on shaft assembly (69).

n. Place thrust washer (17) on shaft assembly (16). Insert shaft assembly (16) through housing assembly (59) and mesh gear on shaft assembly (16) with gear segment (81) on shaft assembly (57). Secure shaft assembly (16) in place with retaining ring (1).

Note: During the drilling operation (if required) maintain 0.015 inch end play in shaft assembly (16) and 0.005 inch end play in shaft assembly (30).

o. Position arm assembly (33) on retaining arm (35) and secure in place with retaining ring (34).

p. Install two O-rings (29) on shaft assembly (30). Place thrust washer (31) over retaining ring side of shaft assembly (30).

q. Insert shaft assembly (30) through housing assembly (59) and secure in place with retaining ring (12).

r. Place stop (14) on shaft assembly (30), align the taper-pin holes, and insert and secure taper pin (13).

s. Install one end of spring (32) on arm assembly (33) and the other on spring retainer (18).

t. Place sleeve (2) on shaft assembly (16) and align the taper pin holes. Insert and secure taper pin (7). Place bushing (3) on sleeve (2).

u. Secure spring (6) to housing assembly (59) and arm (4). Position the forked end of arm (4) in bushing (3) and secure arm (4) to housing assembly (59) with pin (5). Crimp over both ends of pin (5).

Note: Upon completion of the above assembly procedures, check all parts for freedom of movement.

v. Place lamp (24) in housing (25), position housing (25) in bushing (23), and secure in place with flat washer (26), lockwasher (27), and screw (28).

w. When replacing spacer (60) into housing assembly (59), apply Locktite (American Sealant, Grade C, or equivalent) to threads.

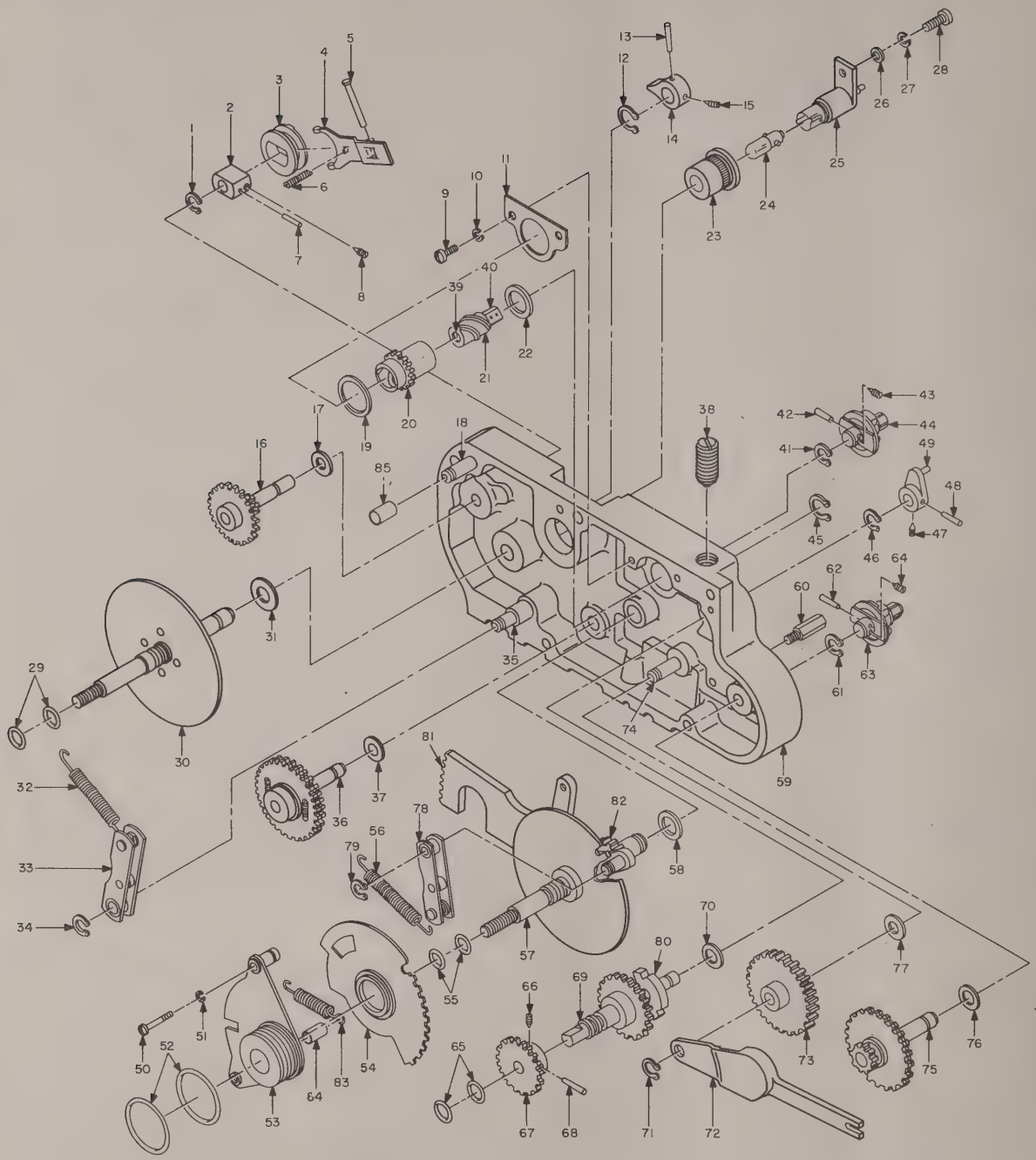
97. Disassembly and Reassembly of Interval Oscillator Module A10 (fig. 79)

a. Disassembly.

(1) Remove two panhead screws (10) and lockwashers (9) that secure cover (8) to header-shield assembly (7). Remove the cover.

(2) Remove retaining ring (16) that secures coupling assembly (1) in header-shield assembly (7) and remove coupling assembly (1).

(3) Remove two screws (2) and two screws (4) that support bearing assemblies (3 and 14) to header-shield assembly (7) and remove the two support bearing assemblies.



NOTES:

1. SETSCREWS (8), (15), (47), AND (66) ARE NOT SUPPLIED WITH THE SELECTOR MECHANISM, BUT ARE USED TO SECURE REPLACEMENT PARTS TO GEAR SHAFTS WHILE DRILLING. THESE SETSCREWS ARE REMOVED AFTER DRILLING OPERATION IS COMPLETED.
2. SETSCREWS (43) AND (64) ARE SUPPLIED WITH THE SELECTOR MECHANISM AND, IF REMOVED, ARE TO BE REPLACED IN COUPLER ASSEMBLIES (44) AND (63).

TM5820-398-35-81

Figure 78. Selector mechanism, exploded view.

1 Retaining ring
2 Sleeve
3 Bushing
4 Arm
5 Pin
6 Spring
7 Taper pin
8 Setscrew
9 Screw
10 Lockwasher
11 Plate
12 Retaining ring
13 Taper pin
14 Stop
15 Setscrew
16 Shaft assembly
17 Thrust washer
18 Spring retainer
19 Thrust washer
20 Gear
21 Worm
22 Thrust washer
23 Bushing
24 Lamp
25 Housing
26 Flat washer
27 Lockwasher
28 Screw
29 O-ring
30 Shaft assembly
31 Thrust washer
32 Spring
33 Arm assembly
34 Retaining ring
35 Retaining arm
36 Antibacklash gear assembly
37 Thrust washer
38 Ball plunger
39 Screw
40 Yoke
41 Retaining ring
42 Taper pin
43 Setscrew
44 Coupler assembly
45 Retaining ring
46 Retaining ring
47 Setscrew
48 Taper pin
49 Arm assembly
50 Screw
51 Lockwasher
52 O-ring
53 Mask assembly
54 Mask assembly
55 O-ring
56 Spring
57 Shaft assembly
58 Thrust washer
59 Housing assembly
60 Spacer
61 Retaining ring
62 Taper pin
63 Coupler assembly
64 Setscrew
65 O-ring
66 Setscrew
67 Gear
68 Taper pin
69 Shaft assembly
70 Thrust washer
71 Retaining ring
72 Gear arm
73 Spur gear
74 Stud
75 Shaft assembly
76 Thrust washer
77 Thrust washer
78 Arm assembly
79 Retaining ring
80 Cam
81 Gear segment
82 Gear
83 Spring
84 Sleeve
85 Sleeve

Figure 78 – Continued.

(4) Remove four panhead screws (13), four hexagonal nuts (4) and eight washers (12), securing board assemblies (6 and 11) to header-shield assembly (7) and remove the two board assemblies.

b. Assembly.

(1) Install board assemblies (6 and 11) on header-shield assembly (7) and secure them with four panhead screws (13), eight lockwashers (5 and 12), and four hexagonal nuts (4).

(2) Install two support bearing assemblies (3 and 14) on header-shield assembly (7) and secure with four panhead screws (2 and 15).

(3) Position coupler assembly (1) through support bearing assemblies (3 and 14). Secure it with retainer ring (16).

(4) Install cover (8) on header-shield assembly (7) and secure it with two panhead screws (10), and lockwashers (9).

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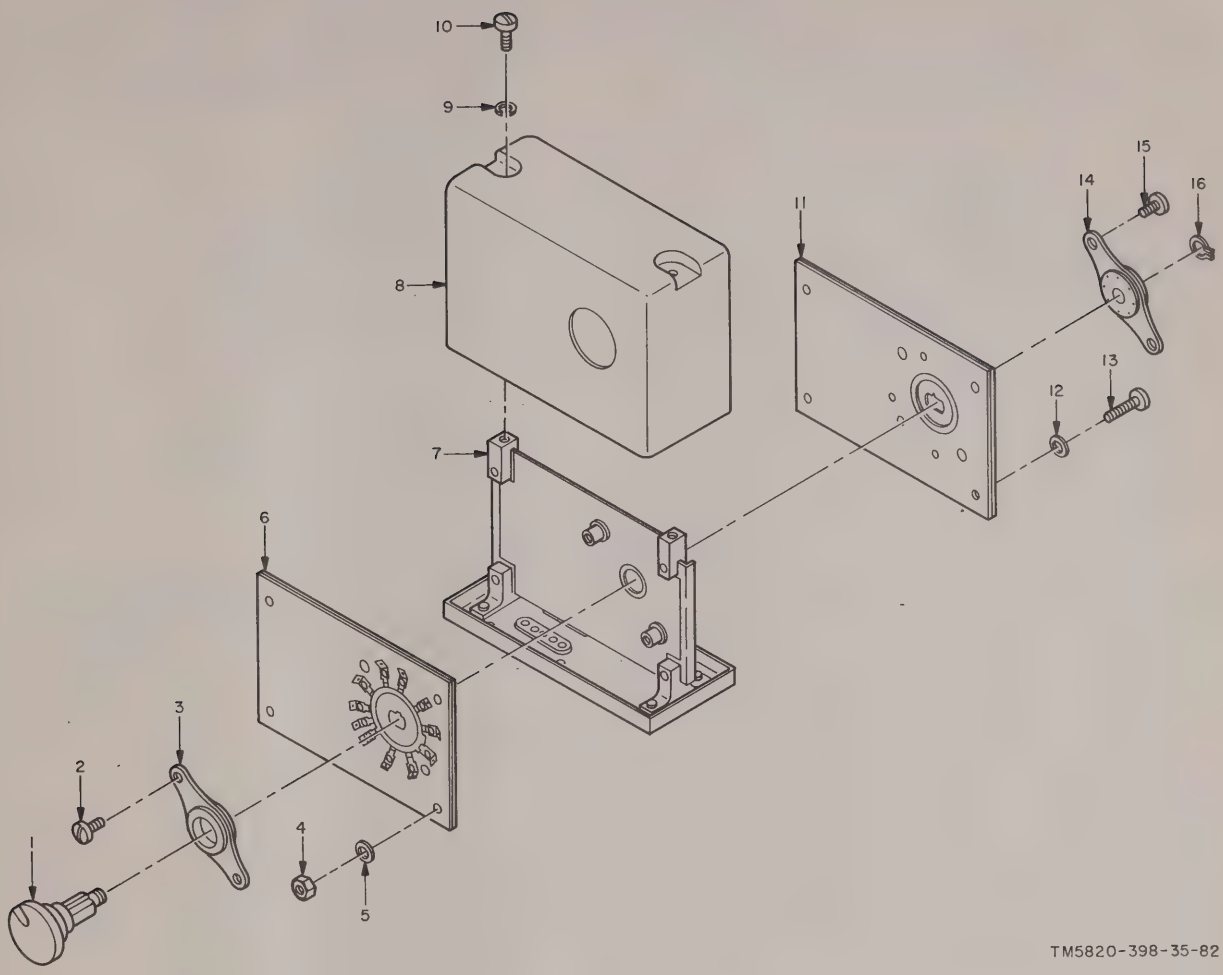
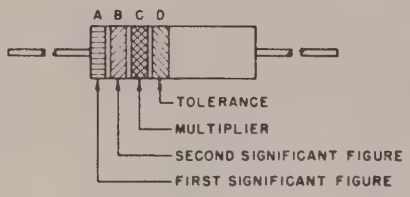


1 Coupling assembly
2 Screw
3 Support bearing assembly
4 Hexagonal nut
5 Washer
6 Board assembly
7 Header-shield assembly
8 Cover
9 Lockwasher
10 Panhead screw
11 Board assembly
12 Washer
13 Panhead screw
14 Support bearing assembly
15 Screw
16 Retaining ring

Figure 79. Module A10, exploded view.

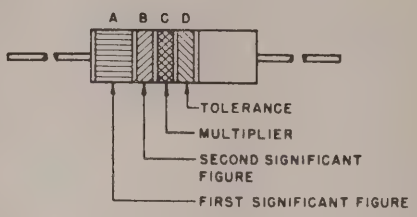
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

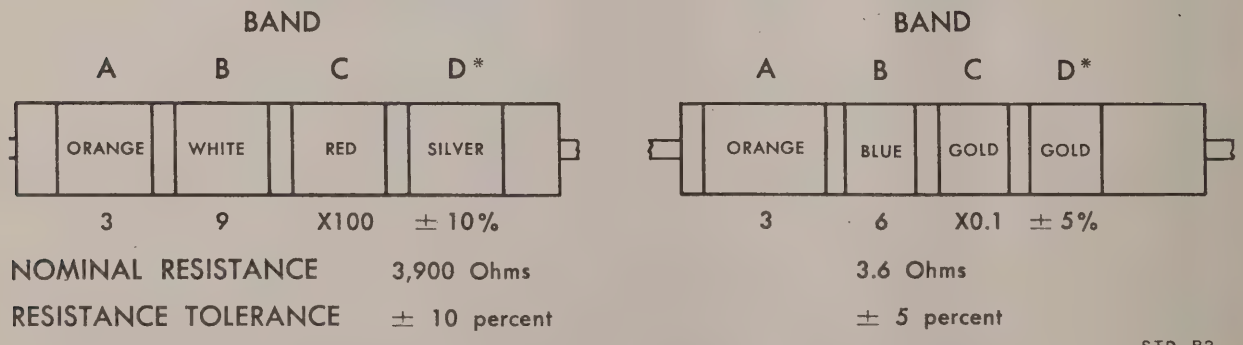


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	5	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

Figure 80. MIL STD resistor color code.

	CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
	CM	CN	CY	CB	CM	CM	CM
%		A				−55° to +70°C	10–55 cps
	B	E		B			
%	C		C			−55° to +85°C	
	D			D	300		
	E					−55° to +125°C	10–2,000 cps
	F				500		
						−55° to +150°C	
%							
%							

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

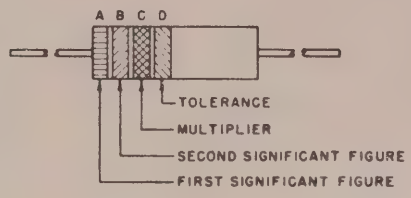
ed to obtain the capacitance in uuf.

, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.

MIL–C–11015.

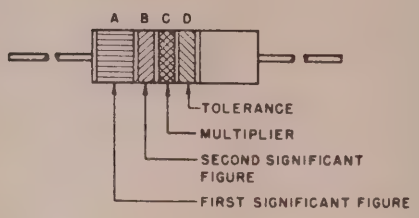
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

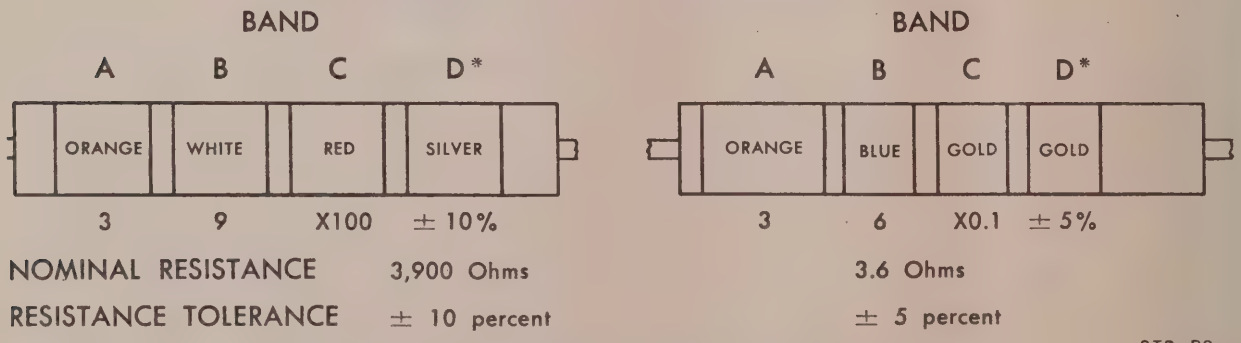


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

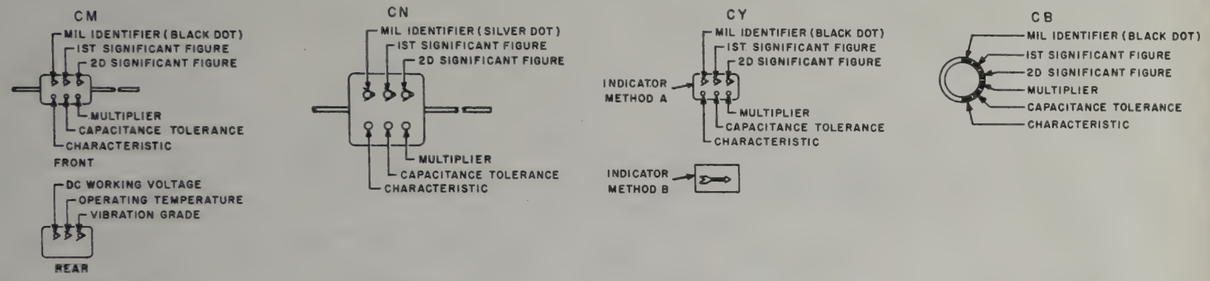
STD-R2

*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

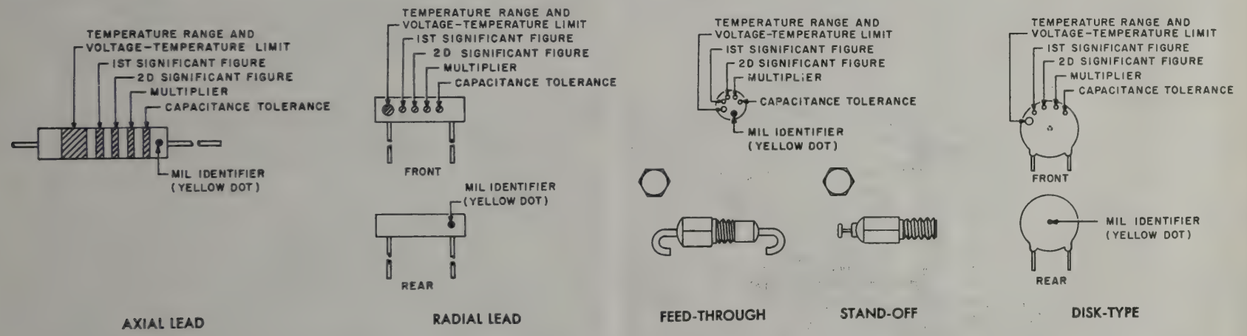
Figure 80. MIL STD resistor color code.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC

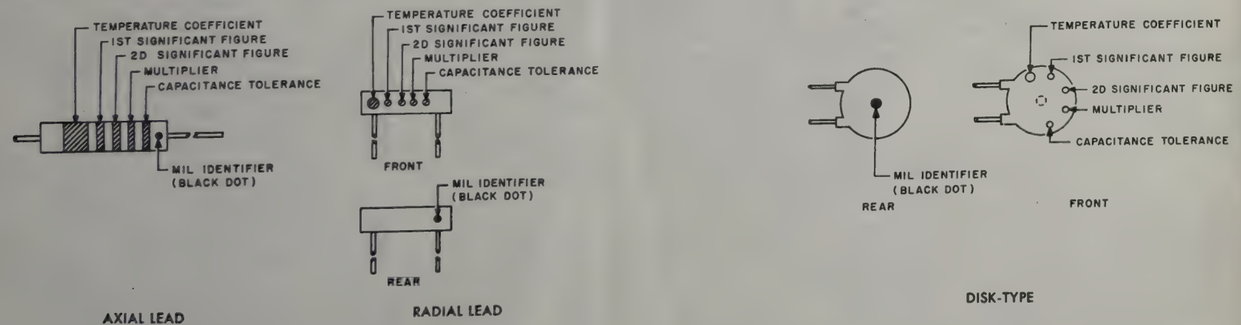


Figure 81. MIL STD capacitor color codes.

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

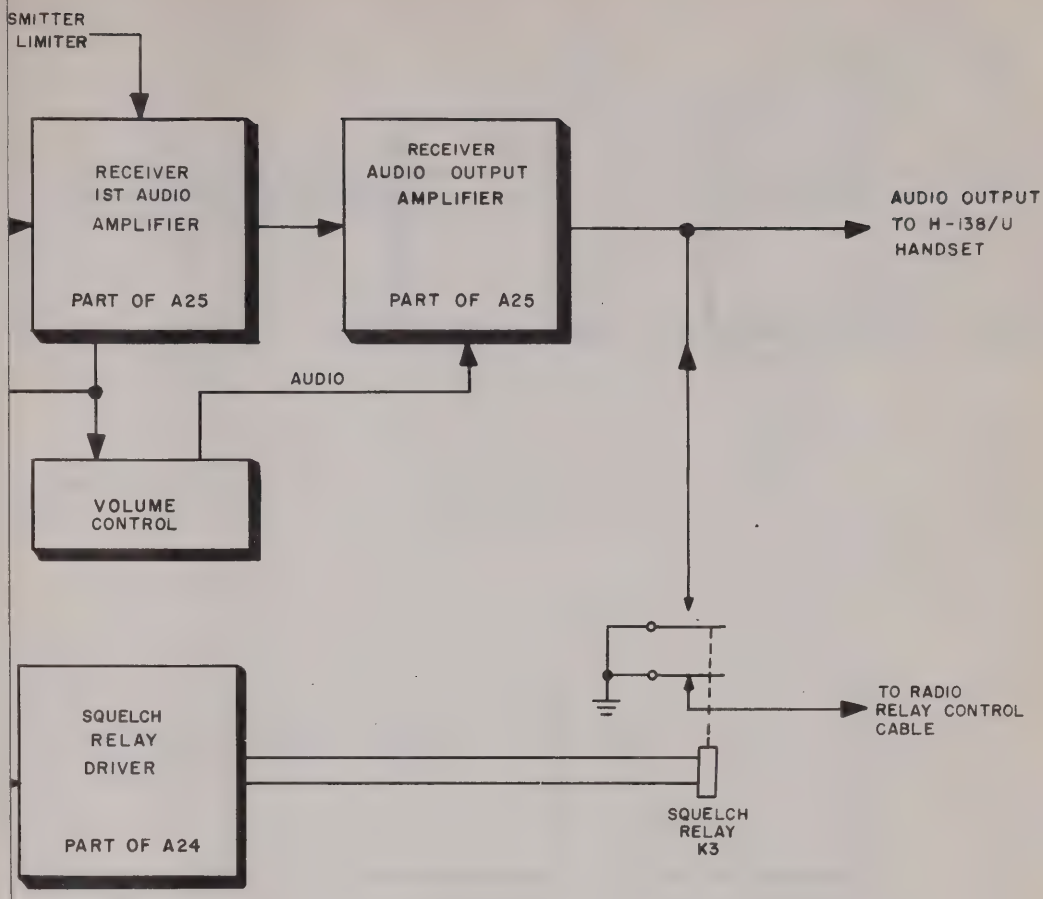
COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD–C2



NOTE:

CARRIER FREQUENCY
b = OPERATING FREQUENCY OF VARIABLE FREQUENCY OSCILLATOR

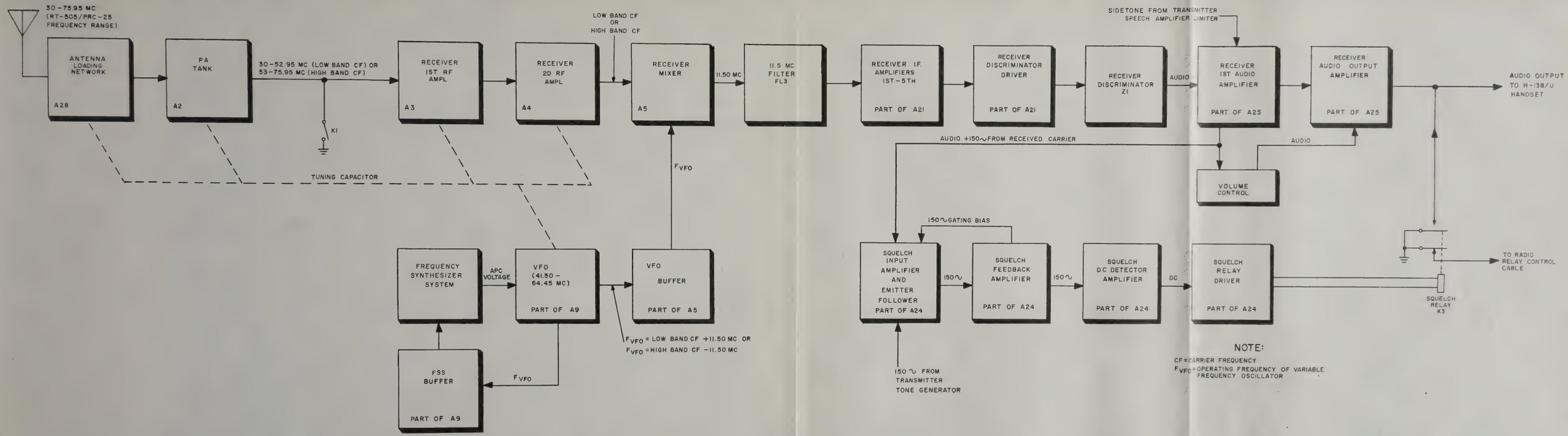
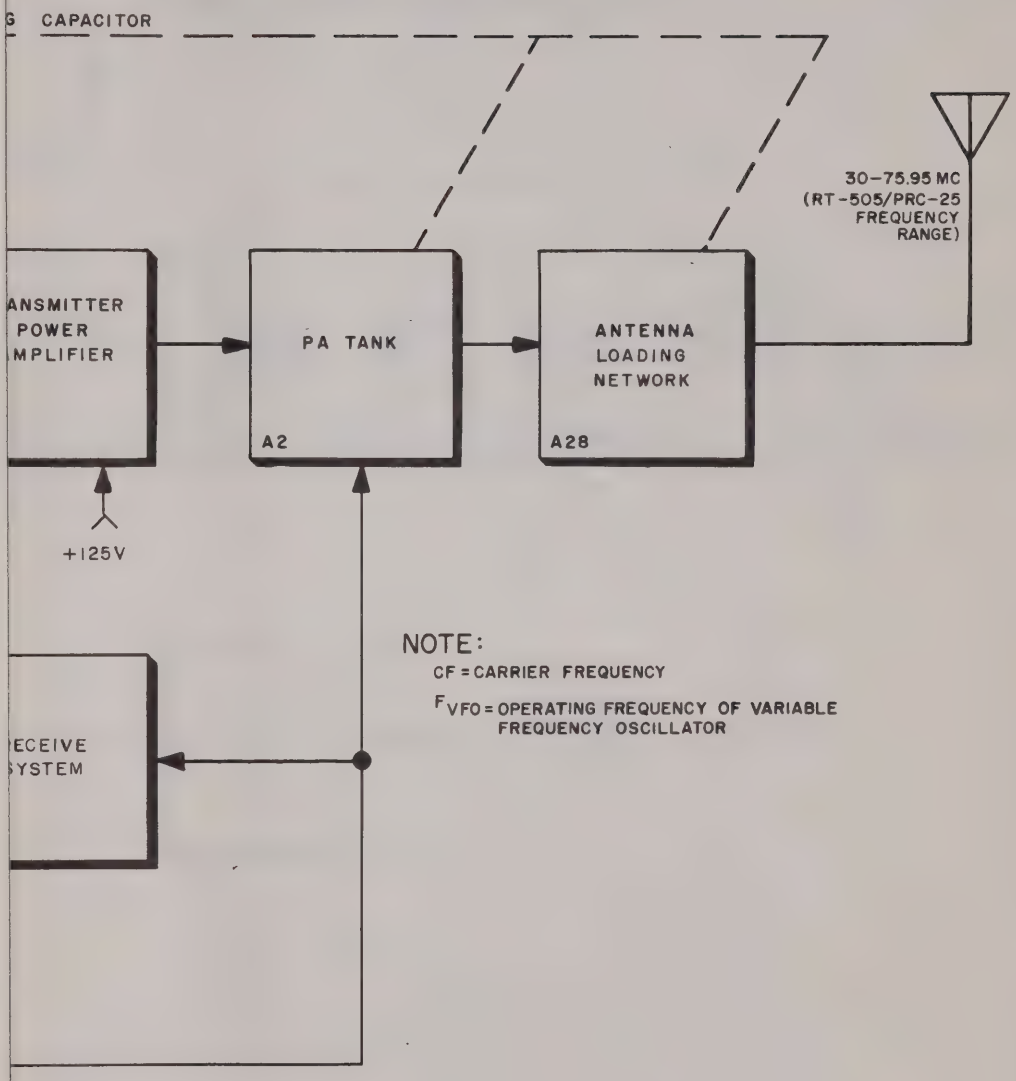


Figure 82. Receiver-transmitter block diagram, received signal paths.



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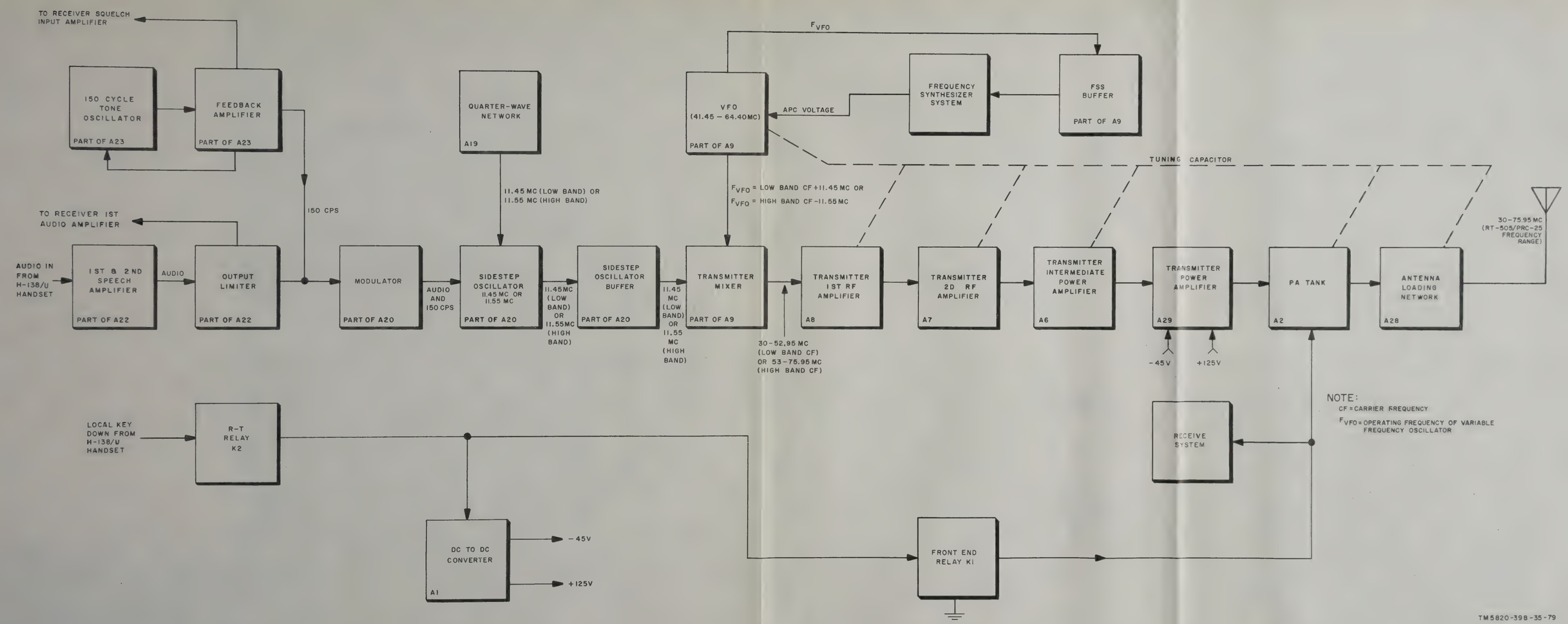
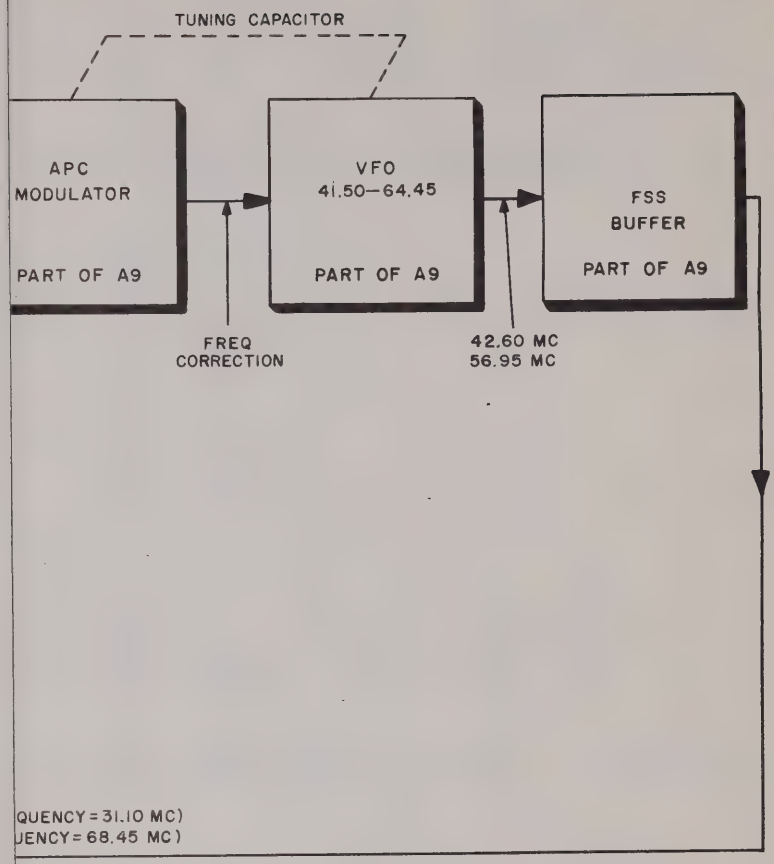


Figure 83. Receiver-transmitter block diagram, transmitted signal paths.



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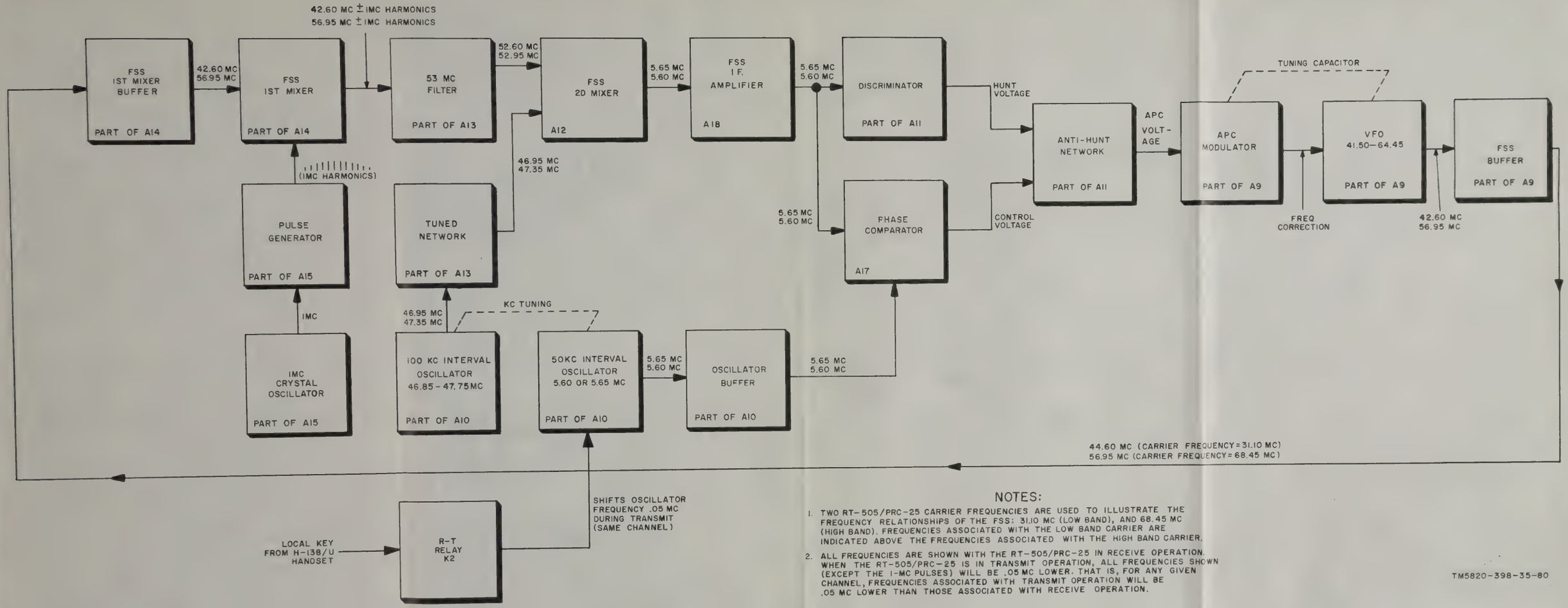

NOTES:

1. TWO RT-505/PRC-25 CARRIER FREQUENCIES ARE USED TO ILLUSTRATE THE FREQUENCY RELATIONSHIPS OF THE FSS: 31.10 MC (LOW BAND), AND 68.45 MC (HIGH BAND). FREQUENCIES ASSOCIATED WITH THE LOW BAND CARRIER ARE INDICATED ABOVE THE FREQUENCIES ASSOCIATED WITH THE HIGH BAND CARRIER.
2. ALL FREQUENCIES ARE SHOWN WITH THE RT-505/PRC-25 IN RECEIVE OPERATION. WHEN THE RT-505/PRC-25 IS IN TRANSMIT OPERATION, ALL FREQUENCIES SHOWN (EXCEPT THE I-MC PULSES) WILL BE .05 MC LOWER. THAT IS, FOR ANY GIVEN CHANNEL, FREQUENCIES ASSOCIATED WITH TRANSMIT OPERATION WILL BE .05 MC LOWER THAN THOSE ASSOCIATED WITH RECEIVE OPERATION.

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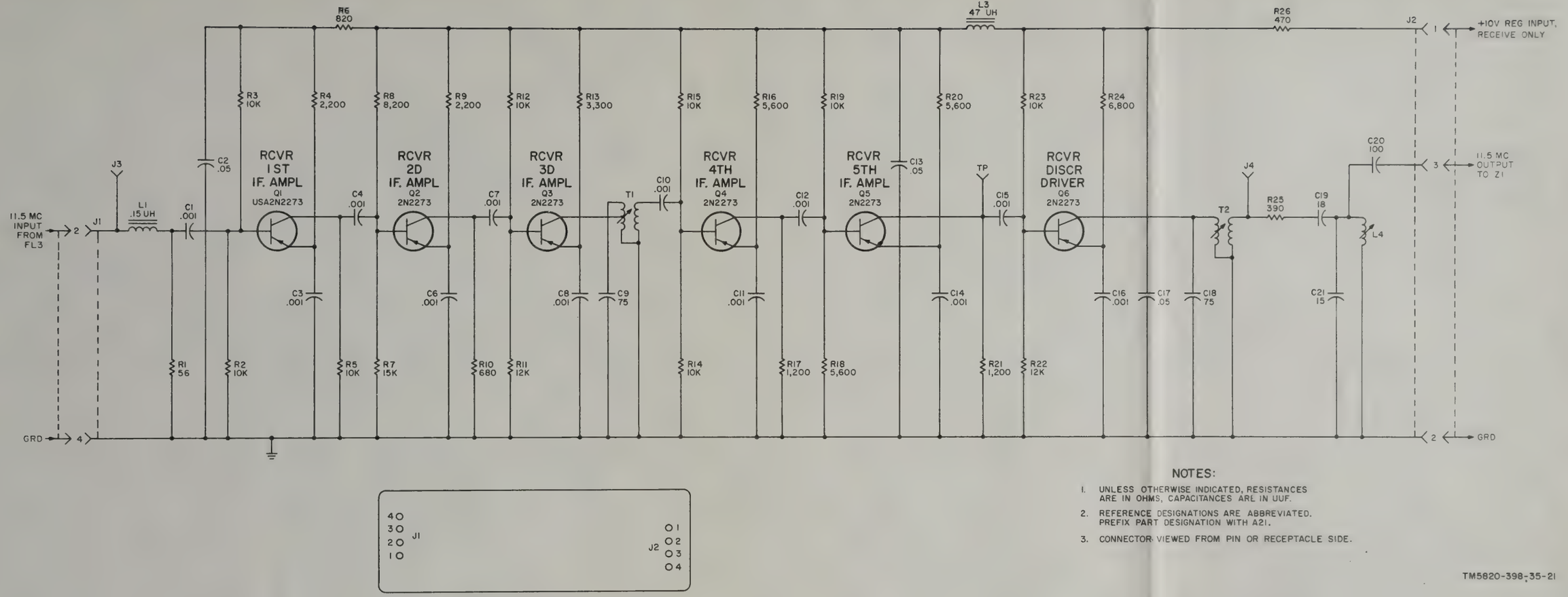
Figure 84. Frequency synthesizer system, block diagram.

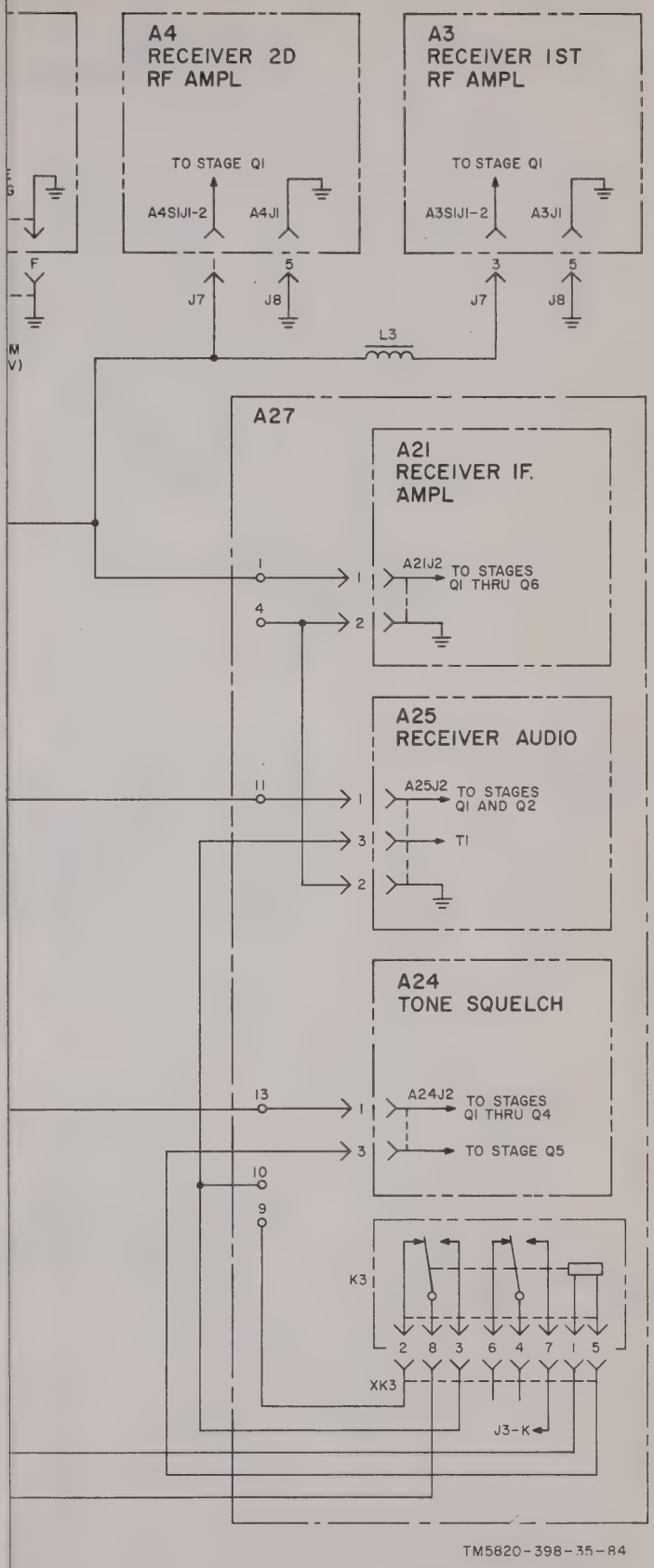


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX PART DESIGNATION WITH A21.
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

TM5820-398-35-21

Figure 85. Receiver if. amplifier module A21, schematic diagram.



TM5820-398-35-84

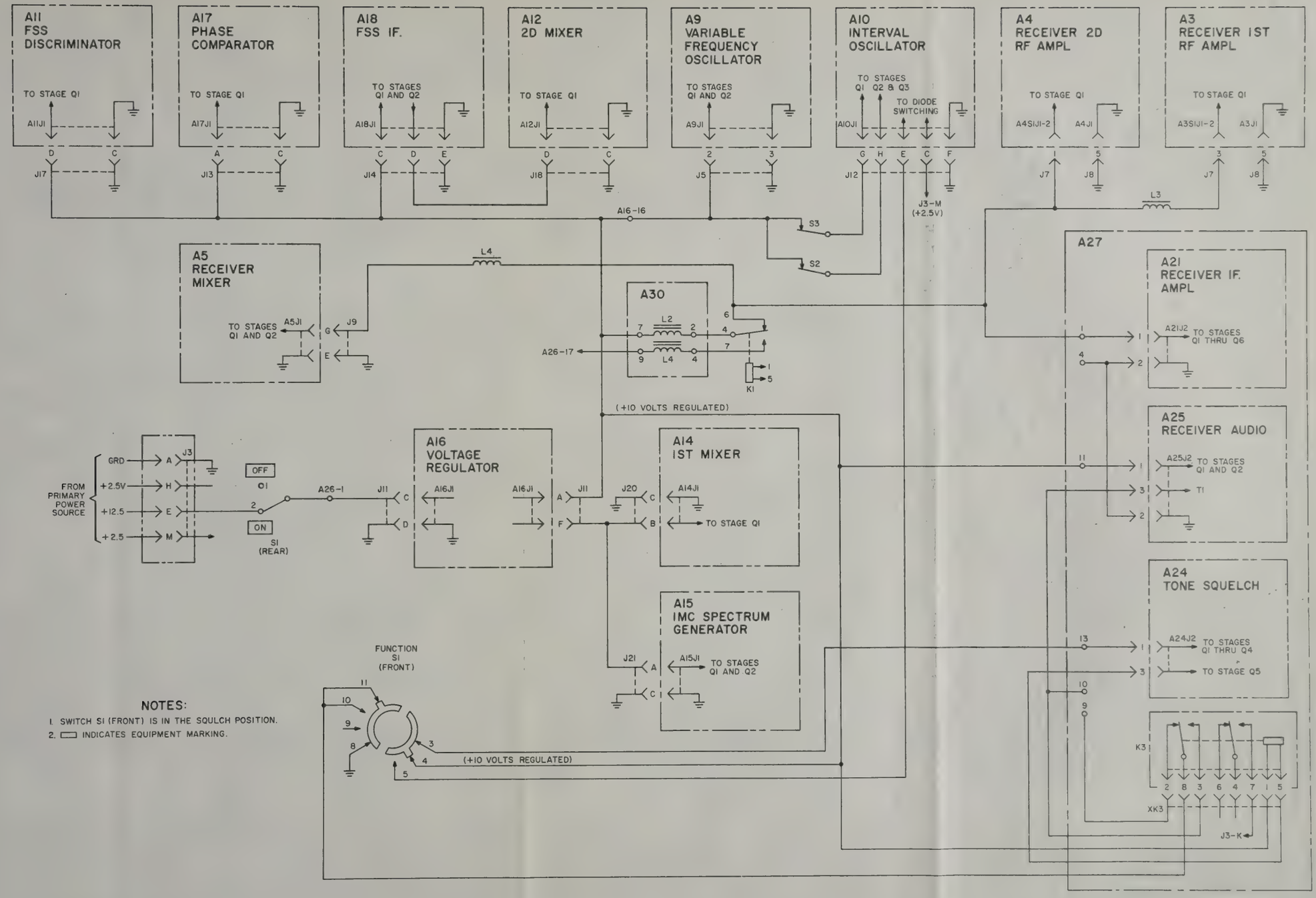
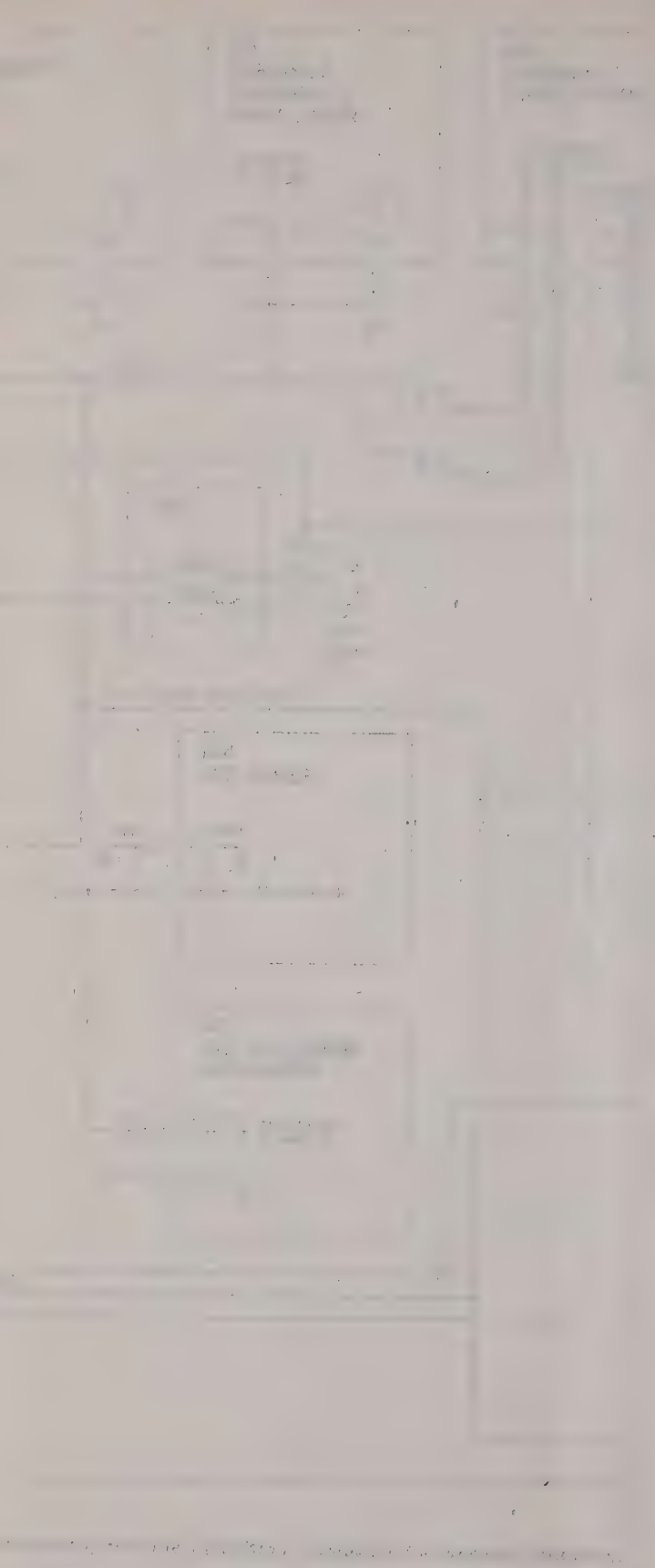
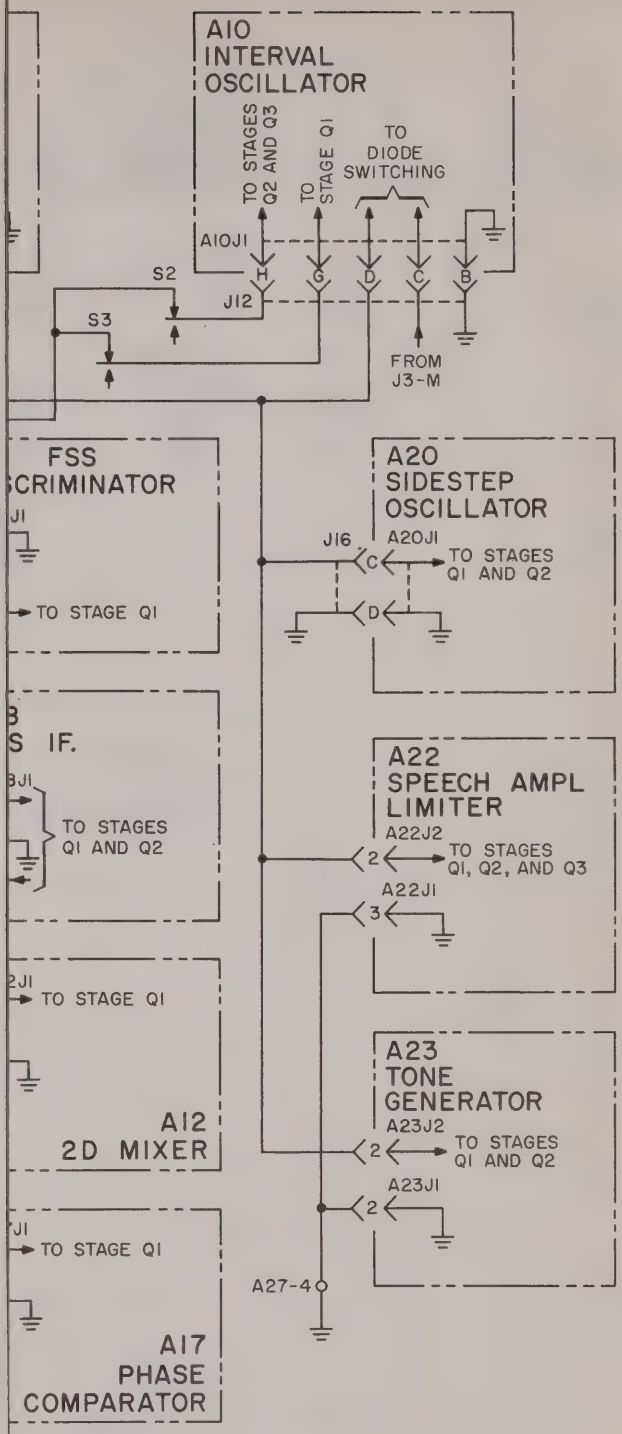


Figure 86. Power distribution, receive condition, simplified schematic diagram.





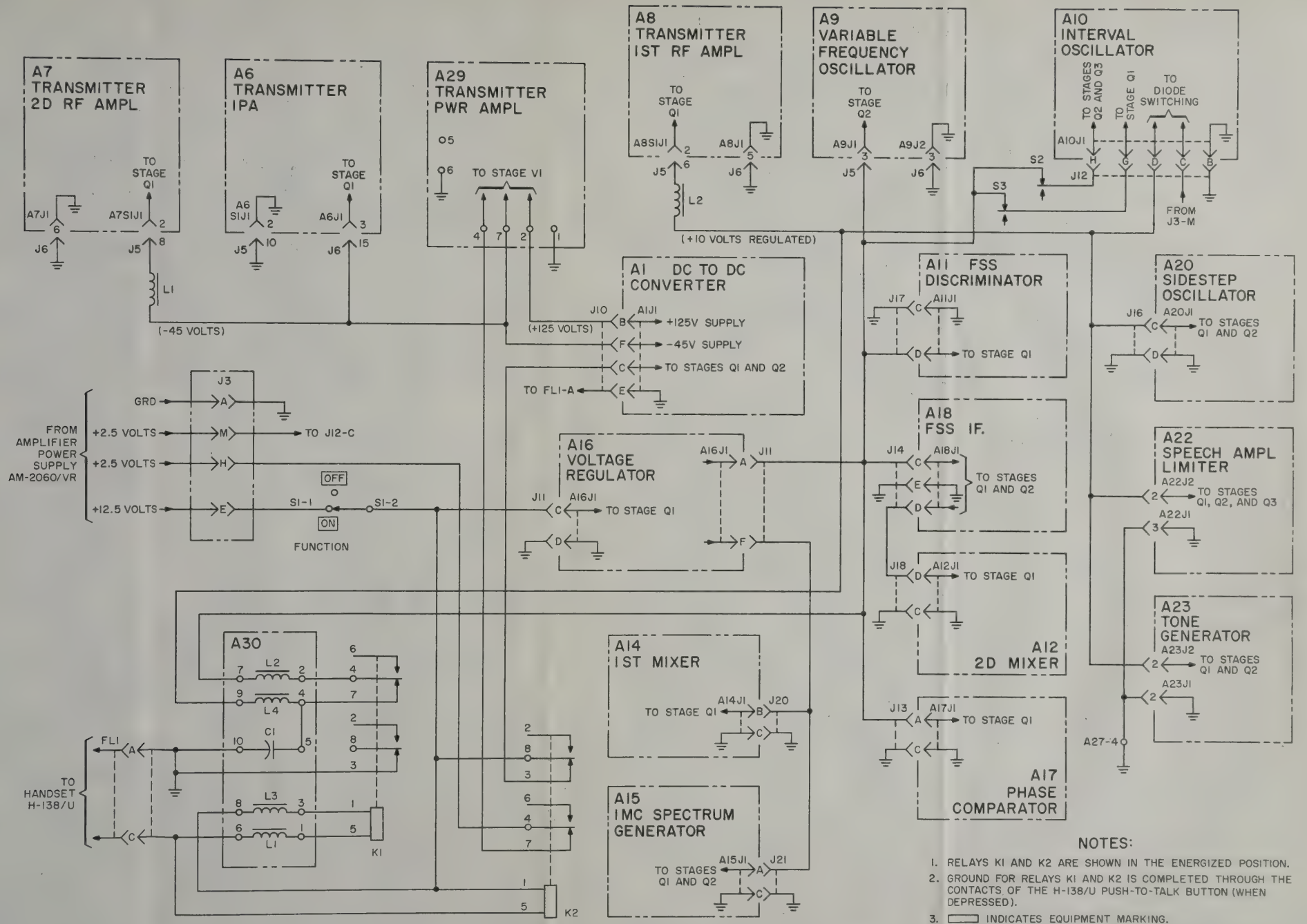
NOTES:

RELAYS K1 AND K2 ARE SHOWN IN THE ENERGIZED POSITION.

GROUND FOR RELAYS K1 AND K2 IS COMPLETED THROUGH THE CONTACTS OF THE H-138/U PUSH-TO-TALK BUTTON (WHEN DEPRESSED).

▭ INDICATES EQUIPMENT MARKING.

TM5820-398-35-85

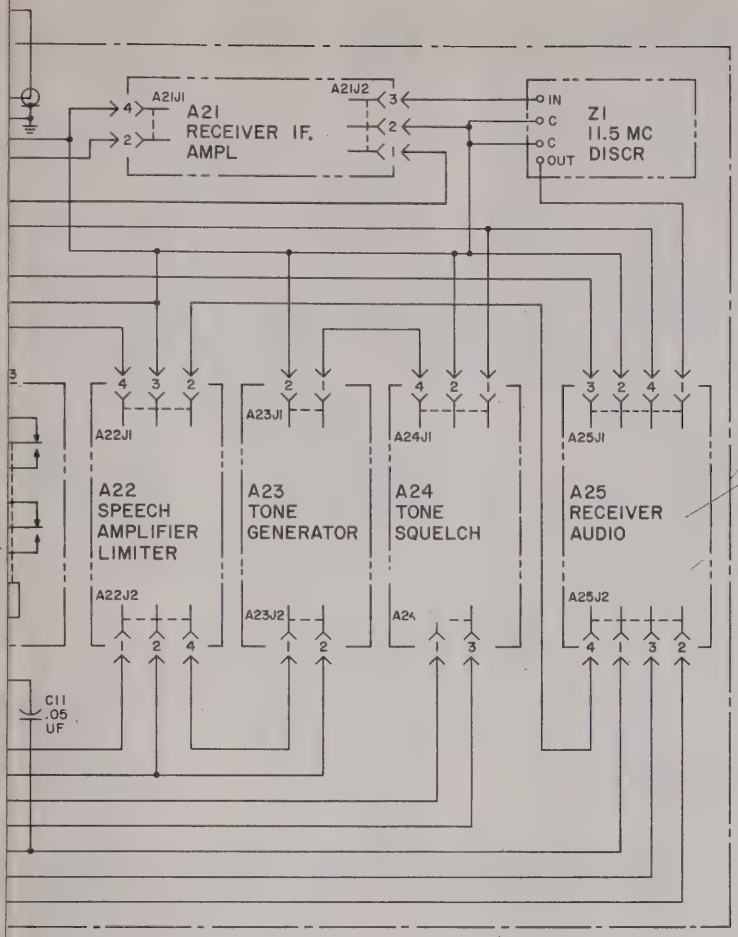


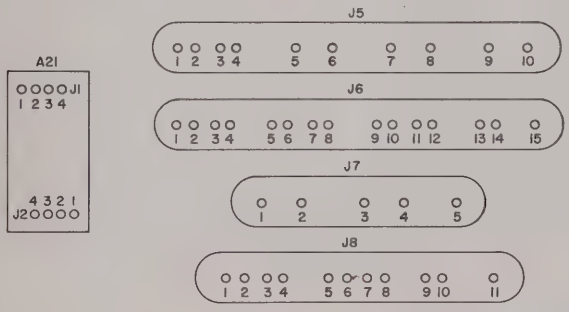
NOTES:

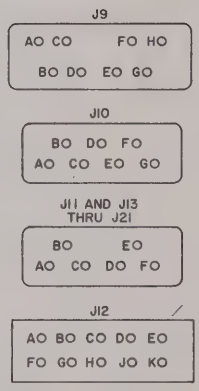
1. RELAYS K1 AND K2 ARE SHOWN IN THE ENERGIZED POSITION.
2. GROUND FOR RELAYS K1 AND K2 IS COMPLETED THROUGH THE CONTACTS OF THE H-138/U PUSH-TO-TALK BUTTON (WHEN DEPRESSED).
3. ▭ INDICATES EQUIPMENT MARKING.

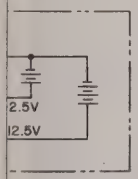
TM5820-398-35-85

Figure 87. Power distribution, transmit condition, simplified schematic diagram.





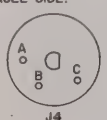




NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. WAFER SWITCHES SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AND ARE VIEWED FROM FRONT.
3. ▭ INDICATES EQUIPMENT MARKING.
4. RECEPTACLE VIEWED FROM PIN OR RECEPTACLE SIDE.

FL1 & FL2



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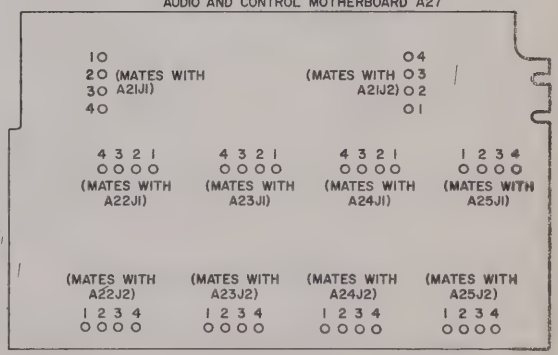
AUDIO AND CONTROL MOTHERBOARD A27



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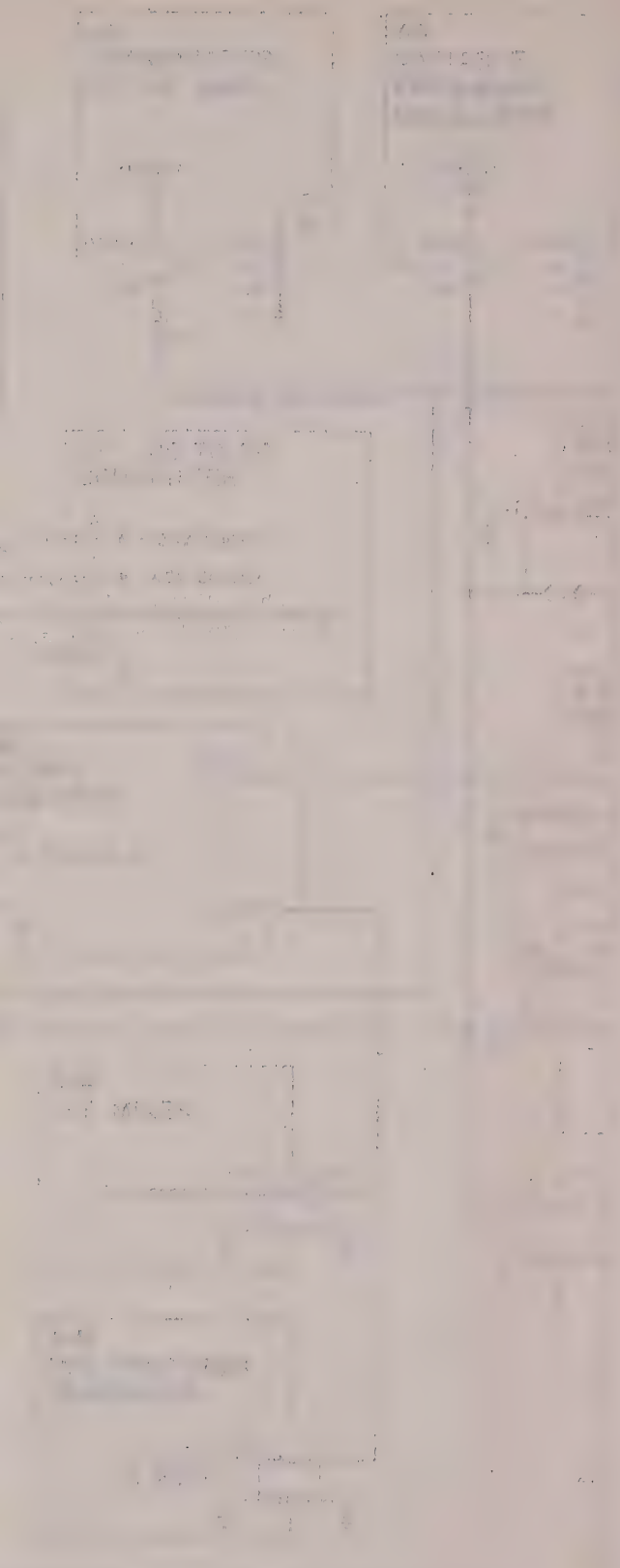

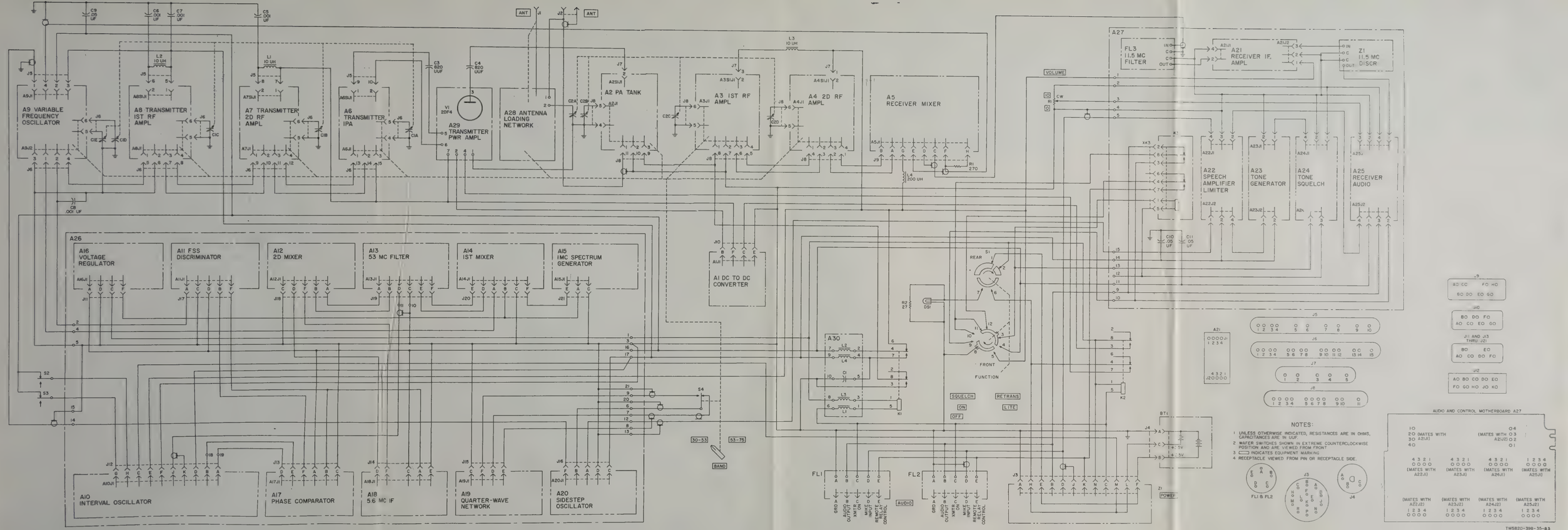

Figure 88. Receiver-Transmitter, Radio RT-505/PRC-25, overall schematic diagram.

APPENDIX
REFERENCES

TA 11-17	Signal Field Maintenance Shops
TA 11-100 (11-17)	Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shops.
TM 11-1257	Signal Generator AN/URM-48
TM 11-5057	Frequency Meter AN/USM-26
TM 11-5097	Spectrum Analyzers TS-723A/U, TS-723B/U, and TS-723C/U
TM 11-5129	Oscilloscopes AN/USM-50A, B, and C
TM 11-5133	Radiofrequency Wattmeter AN/URM-43A
TM 11-5551E	R. F. Signal Generator AN/URM-25F
TM 11-5820-398-10	Operator's Manual: Radio Set AN/PRC-25
TM 11-5820-398-20	Organizational Maintenance Manual: Radio Set AN/PRC-25
TM 11-5820-398-20P	Organizational Maintenance Repair Parts and Special Tools List: Radio Set AN/PRC-25
TM 11-5820-398-35P	Field and Depot Maintenance Repair Parts and Special Tools List: Radio Set AN/PRC-25
TM 11-6625-200-12	Operation and Organizational Maintenance Manual: Multimeters ME-26A/U and ME-26B/U
TM 11-6625-261-12	Operator's and Organizational Maintenance Manual: Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U
TM 11-6625-320-12	Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U and ME-30C/U
TM 11-6625-400-12	Operator and Organizational Maintenance Manual: Meter, Modulation ME-57/U

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By Order of Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
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For explanation of abbreviations used, see AR 320-50.

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